

AD-A061 156

ARINC RESEARCH CORP ANNAPOLIS MD
RELIABILITY, MAINTAINABILITY, AND AVAILABILITY CHARACTERISTICS --ETC(U)
JUN 72 F E ERDLE
983-02-1-1176

F/G 17/9

N00019-71-C-0355

NL

UNCLASSIFIED

1 OF 2
AD
A061156



LEVEL II

6

Publication 983-02-1-1176

ADA061156

FINAL REPORT
RELIABILITY, MAINTAINABILITY, AND AVAILABILITY CHARACTERISTICS
OF 1527 BASELINE AND OTHER BASELINE CONFIGURATIONS
OF RADAR SET AN/APG-59/AWG-10 (U)

Volume II
APPENDIX B. DESCRIPTIONS OF THE ARINC RESEARCH
3M DATA-PROCESSING ALGORITHMS

18 June 1972

Prepared for
NAVAL AIR SYSTEMS COMMAND
AIR 533
WASHINGTON, D. C.
under Contract N00019-71-C-0355

DDC
RECEIVED
NOV 7 1978
F

ARINC RESEARCH CORPORATION

DDC FILE COPY

This document has been approved
for public release and sale; its
distribution is unlimited.

78 11 02 035

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
983-02-1-1176		
4. TITLE (and Subtitle)		5. TYPE OF REPORT & PERIOD COVERED
Reliability, Maintainability, and Availability Characteristics of 1527 Baseline Configurations of Radar Set an/ARG-59/ARG-10 (U)		
7. AUTHOR(s)	6. PERFORMING ORG. REPORT NUMBER	
F.E. Erdle	983-02-1-1176	
9. PERFORMING ORGANIZATION NAME AND ADDRESS		8. CONTRACT OR GRANT NUMBER(s)
ARINC Research Corporation 2551 Riva Road Annapolis, Maryland 21401		N00019-71-C-0355
11. CONTROLLING OFFICE NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
Naval Air Systems Command Washington D.C.		
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE
same as above		13. NUMBER OF PAGES
		15. SECURITY CLASS. (of this report)
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report)		
UNCLASSIFIED UNLIMITED		
<div style="border: 1px solid black; padding: 5px; display: inline-block;"> This document has been approved for public release and sale; its distribution is unlimited. </div>		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
UNCLASSIFIED-UNLIMITED		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)		
ON THE BACK		

This final report, prepared under Contract No0019-71-C-0355 for the Naval Air Systems Command, presents ARINC Research Corporation's findings, conclusions, and recommendations derived from a one-year cost effectiveness engineering study of the reliability, maintainability and availability (RMA) characteristics of a new, 1527-configuration baseline system, obtained by use of the earliest maintenance and flight statistics data available through the Navy 3M data collection system.

6
9
FINAL REPORT,

6
RELIABILITY, MAINTAINABILITY, AND AVAILABILITY CHARACTERISTICS
OF 1527 BASELINE AND OTHER BASELINE CONFIGURATIONS
OF RADAR SET AN/APG-59/AWG-10 (2)

Volume II,

Appendix B, Descriptions of the ARINC Research
3M Data-Processing Algorithms,

DDC
RECEIVED
NOV 7 1978
F

11
18 June 1972

12 158p.

10
F. E. Erdle

Prepared for
Naval Air Systems Command
Air 533
Washington, D.C.
under Contract N00019-71-C-0355 new

15
This document has been approved
for public release and sale; its
distribution is unlimited.

ARINC Research Corporation
a Subsidiary of Aeronautical Radio, Inc.
2551 Riva Road
Annapolis, Maryland 21401 ✓
Publication 983-02-1-1176
14

400 247

78 11 02 035 LB

Copyright © 1972

ARINC Research Corporation

**Prepared under Contract N00019-71-C-0355
which grants to the U.S. Government a license
to use any material in this publication for
Government purposes.**

ABSTRACT

This final report, prepared under Contract N00019-71-C-0355 for the Naval Air Systems Command, presents ARINC Research Corporation's findings, conclusions, and recommendations derived from a one-year cost-effectiveness engineering study of the AN/APG-59/AWG-10 radar set. The report provides an analysis of the reliability, maintainability, and availability (RMA) characteristics of a new, 1527-configuration baseline system, obtained by use of the earliest maintenance and flight statistics data available through the Navy 3M data collection system.

In addition, the report describes in detail the methods of data processing and analysis employed in the study. These methods were developed during the project by refinement of techniques which had previously been used effectively on other AN/APG-59/AWG-10 projects for 3M data analysis but had not been completely documented.

This report consists of three volumes.

- Volume I (Confidential) describes the activities of the study project and the analysis results. It also presents, as Appendix A, a collection of the special letter reports submitted to NAVAIR during the project period.
- Volume II (Unclassified) is Appendix B. It provides descriptions of the ARINC Research data-processing algorithms.
- Volume II (Confidential) is Appendix C. It presents abstracts of computer-generated maintenance data and reliability-maintainability indices displays. Its purpose is to illustrate the various displays that are described in detail in Appendix B (Volume II).

ACCESSION for	White Section	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	NTIS		
	DDC		
	UNANNOUNCED JUSTIFICATION		
BY	DISTRIBUTION/AVAILABILITY CODES		SPECIAL
	A		

FOREWORD

The displays of maintenance/aircraft statistical data and derived reliability and maintainability indices described in this appendix are products of the ARINC Research Corporation's algorithms for aviation "3M" data processing and analysis.

The computer-programmed algorithms and the displays have been designed to process data reported in accordance with the detailed documentation procedures for maintenance-data reporting described in the Naval Aviation Maintenance Program (NAMP) manuals, OPNAVINST 4790.2, including change number 1.

The algorithms and displays are especially oriented toward the needs of NAVAIR and similar commands' engineering sections and branch activities whose interests are in reliability and maintainability analyses on aircraft subsystems.

The algorithms were developed under Contract N00019-71-C-0355 to provide analyses on data for the AN/APG-59 radar set of the AN/AWG-10 missile control system used on F4-J aircraft. However, except for three of the displays, they are applicable for use in analyzing data for any system reported under the Maintenance Data Collection System (MDCS) and the Aircraft Statistical Data (ASD) system of the NAMP. Relatively minor changes to the three computer programs which are currently not general in scope could be made to adapt them for universal applications.

This set of displays will be particularly useful to persons who are interested in the following aspects of subsystem development and improvement:

- (1) Assessments of operational reliability and maintainability for subsystems and LRUs of interest
- (2) Observation of R&M trends on subsystems
- (3) Identification of problem areas, by functional group and LRU, to be subjects for detailed engineering investigations
- (4) Decisions on needed system improvements
- (5) Measurements of the impact of specific improvements on systems, functional groups, or LRUs
- (6) Replacement rates for parts and major components

CONTENTS

	<u>Page</u>
ABSTRACT	iii
FOREWORD	v
1. INTRODUCTION	1
1.1 File Record Format Outline	1
1.2 Error Detection	2
2. GENERAL PROCESSING REMARKS FOR ARINC RESEARCH DATA FILE, MDCS-983	5
2.1 File Format	5
2.2 Data-Element Redundance and Data-Element Location on 3M CTs	11
2.3 Assumptions Regarding Errors on CTs	12
2.4 Modification of Blank Spaces in Certain CT Fields	12
2.5 Residue File	13
2.6 Data Transcription Process Flow Diagram	19
3. LIST OF 983 MDCS/ASD DATA AND RM INDICES DISPLAYS	74
3.1 Maintenance Data and RM Indices Displays	74
3.2 MDCS/ASD File Survey Displays	74
4. DESCRIPTION OF THE 983-MDCS/ASD DISPLAYS	74
4.1 MDCS/ASD-983 Computer Display No. 1 -- Maintenance Actions, Removed Items, and Flight Time by individual Systems	75
4.2 System Reliability Summary Display	85
4.3 983-MDCS/ASD LRU Reliability Display	105
4.4 LRU Maintenance Actions Summary Display	112
4.5 Display of Reliability Indices for LRU and Functional Group	114

	<u>Page</u>
4.6 Replaced Failed Material Display	116
4.7 Replaced Major Components and Subassemblies Display	120
4.8 System Maintainability Display	121
4.9 LRU Maintainability Display	126
4.10 Master Input Tape Survey - Inventory of Type Equipments, Work Unit Codes, Organization and 3M Card Types	129
4.11 983-MDCS/ASD File Survey Display	132
4.12 Data Transcription Run Error Print-Outs	138
4.13 Residue File Print-Out	147

1. Introduction

In the Navy MDCS, maintenance actions are recorded on computer-card-type (CT) formats. These reference-numbered card types are key-punched at Navy data-processing centers, mainly from hand-scribed maintenance-action form documents (MAF's). Depending on the kind of action being reported (i.e., on-aircraft, off-aircraft, or job-support record keeping), the information is entered during key-punch operations on designated card-type records.

These procedures permit, in the initial stages of data collection and filing, a degree of flexibility which is unnecessary in the later processing and display. Considerable data redundancy exists among the card-type formats, since each is provided with the basic job-identification data elements. This redundancy is necessary, initially, since the records are not generated simultaneously and must, at a later date, be properly correlated to jobs. However, once collection and initial entry into the data system have been accomplished, it is more advantageous from an analysis standpoint to assemble the data in a file on the basis of kind of action, maintenance level, primary or assisting work center, job support data recorded, or other appropriate factor. This type of classification allows elimination of record identification redundancy, and space can be provided in each individual record in one composite format, for all possible data elements which could be reported.

1.1 File Record Format Outline

The outline of the ARINC Research MDCS, 3-M data file format, which conforms to the above described philosophy, is shown in Figure 1. The total number of such records filed is limited only by the total length of tape available. Each record provides for the recording of 302 data elements in 1329 record positions. With this type of format, the data elements are readily available for automated selection to determine

information about maintenance actions at any level of assembly. A more detailed format showing the kinds of data elements included in each section of the file format is included in Section 2.1 of this appendix.

1.2 Error Detection

The data on the MDCS CTs can, of course, be processed without consolidating of the data into a composite format as described above. However, one of the objectives of this system of algorithms has been to provide means for detecting errors. It is mainly to facilitate the error detection process and to assure that the data collected in the file, to be used for analyses, is as error-free as possible that the filing methods described have been adopted.

In order to qualify the various data elements pertaining to each job record for inclusion in the various record positions, the computer-programmed algorithms make use of the redundancy provided by the MDCS collection process. If redundant elements that are required to be identical (according to the rules of the MDCS system for recording data) are found by the computer to be different, such records are rejected as erroneous and print-outs are provided for manual analysis of the error. Also, comparisons are made among different data elements that are required by the MDCS data-recording rules to have certain relationships, and those found inconsistent with the rules are identified as in error.

Detectable errors can originate from the following important cause, among others:

- (1) Missing characters, due either to originator omission or original machine-processing omission
- (2) Key-punch errors(those which are not detectable by MSO validation checks)

- (3) Violations of the rules concerning the consistency of codes used for different but related data elements (e.g., where, according to the rules for recording data, an assisting work center is required to use the same action-taken codes as the primary work center and has violated the rules by using a different, but otherwise acceptable, code).

Fifty-seven error types are specifically recognizable by the computer algorithm and listed on each error print-out at the time of data transcription. These are discussed in a later section of this appendix.

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
JCN	Level-1	Level-2	Level-2	Level-1 & Level-2	Level-1	Level-2	Level-1 & Level-2	Level-1 & Level-2	Level-2	Level-1 & Level-2	Record Residue (Cover-Flow) Indicator
Type Equip. Serial Number	End Items Actions	Major Components Actions	Sub-Assembly Repair Actions	End of Period & Work Stop M.H.A. (Primary Work Centers)	Trouble-Shoot Actions	Trouble-Shoot Actions	Assist. Work Center Actions	End of Period & Work Stop M.H.A. (Assist Work Centers)	End of Period & Work Stop M.H.A. Assembly Repairs	Technical Directive Compliance Data	

FIGURE 1

OUTLINE ARINC RESEARCH MDCS-FILE RECORD

2. General Processing Remarks for ARINC Research Data File, MDCS-983

2.1 File Format

The data elements listed on the MDCS-983 file record format* are arranged in groups which pertain only to data originated by particular levels of maintenance as defined by the 3M system. When transcribing into the MDCS-983 file from 3M source card-type (CT) records, it is essential to assure the selection of data according to the maintenance level pertaining to each MDCS-983 data element. The notes accompanying the detailed MDCS-983 file format sheets give specific instructions on the filing of each data element.

There is a high degree of redundancy of data elements among the 3M source CTs.. A given data element required by the MDCS-983 file and originally reported at a specified maintenance level may exist on, and may be transcribed from, CTs pertaining to the other maintenance levels as well. The degree of redundancy of data elements among 3M CTs is illustrated by Figure 2, which is discussed more fully in Section 2.2 of this appendix.

The 3M CTs numbered 16, 17, 21, 26, and 27 are key-punched only from level-1 MAF multi-copy documents. They may be taken as such (level-1 reports) without checking the "maintenance level" codes recorded on the CT.

The 3M CTs numbered 31, 32, and 34 are key-punched from level-2 MAF's reporting off-equipment work. They may be taken as such (level-2 reports) without checking the "maintenance-level" codes recorded on them. Except for the redundant elements previously mentioned, these contain information pertinent only to level-2 maintenance.

* See the detailed format and accompanying notes following this section. Figure 1 presented a general data-record outline.

FIGURE 2

DISTRIBUTION OF BASIC MDCS/3M DATA ELEMENTS AMONG THE MDCS CARD TYPES

Data Element	System-Level Actions (On-Equipment Level-1 Without Removal of Repairables) MAF-SC					System-Level Actions (Off-Equipment Level-1 For Repair of Repairables) MAF MC-1					System-Level Actions (Off-Equipment Level-1 For Repair of Repairables) MAF MC-3					Technical Directive Compliance Card Types		
	11	12	16	17		21	26	27		31	32	33	41	46	47			
Job Control Number:																		
Organization	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN			
Date	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N			
Serial	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN			
Suffix	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
Type Equipment	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN			
Block-1	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3			
Block-2	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N			
Block-3	4-7	4-7	4-7	4-7	4-7	4-7	4-7	4-7	4-7	4-7	4-7	4-7	4-7	4-7	4-7			
Block-4	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN			
Block-5	8-10	8-10	9-10	8-10	8-10	8-10	8-10	8-10	8-10	8-10	8-10	8-10	8-10	8-10	8-10			
Block-6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
Block-7	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN			
Block-8	12-15	12-15	12-15	12-15	12-15	12-15	12-15	12-15	12-15	12-15	12-15	12-15	12-15	12-15	12-15			
Block-9	16-21	16-21	16-21	16-21	16-21	16-21	16-21	16-21	16-21	16-21	16-21	16-21	16-21	16-21	16-21			
Action Organization	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN			
Work Center	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN			
Maintenance Level	25-27	25-27	25-27	25-27	25-27	25-27	25-27	25-27	25-27	25-27	25-27	25-27	25-27	25-27	25-27			
Action Date	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N			
Work Unit Code	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28			
When Discovered	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N			
	29-32	29-32	29-32	29-32	29-32	29-32	29-32	29-32	29-32	29-32	29-32	29-32	29-32	29-32	29-32			
	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN			
	33-39	33-39	33-39	33-39	33-39	33-39	33-39	33-39	33-39	33-39	33-39	33-39	33-39	33-39	33-39			
	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN			
	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40			

*Block Nos in parentheses apply to TDCF's, card types 41, 46 and 47
 **Card Col. 11 if CT 12 Nos suffixed.

Apply only to records with suffixed JONS

Data Element	Location Or Basic Record	System Level Actions (On-Equipment Level-1 Without Removal of Repairables) MAF-SC				System Level Actions (On-Equipment Level-1 For Removal of Repairables) MAF MC-1				ISU-Level Actions (Off-Equipment Level 2 For Repair of Repairables) MAF MC-3				Technical Directive Compliance	
		11	12	16	17	21	26	27	31	32	33	41	42	Card Types	47
- Card Columns -															
Type Maintenance	Block-10	A	41			A	41		A	41					
Action Taken	Block-11	AN	42	AN	25	AN	25	AN	AN	42					
Identification Code	Block-12	N	43-45	N	26-28	N	43-45	N	N	43-45					
Items Processed	Block-13	N	46-47			N	46-47		N	46-47					
Man Hours	(Block 10*)	N				N			N						
	Block-14	N	48-51			N	48-51		N	48-51					
	(Block 11*)	N				N			N						
Elapsed Maintenance Time	Block-15	N	52-54			N	52-54		N	52-54					
Removed Item:	Block-20	-				-			-						
W/S.	Block-20.1	AN	55-59	AN	40-44	AN	40-44		AN	55-59					
Serial Number	Block-20.2			AN	45-54		45-54		AN						
Part Number	Block-20.3	AN	60-74	AN	55-69		55-69		AN	60-74					
Water Reading (Time/Cycle)	Block-20.4			AN	70-74		70-74		AN						
Any Code	-	AN	78	AN	78	AN	78	AN	AN	78					

*Block Nos. in parentheses apply to TUCF's, Card Types 41, 46 and 47.

System-level Actions
(On-System Level-1
Without Removal of Retainables)

System-Level Actions
(On-Equipment Level-1
For Removal of Repairables)

[illegible]

Technical Directive
Compliance
Card # 1000

41	46	47
----	----	----

Card Types	32	31
------------	----	----

$$\begin{array}{r} 21 \\ 26 \\ \hline 27 \end{array}$$

11	12	16	17
Card Types			

	O	C	H
	71	m	(f)
	D	f	O
	O	O	I-

Element

System Level Actions
(On-Equipment Level-1
Without Removal of Repairables)
NAF-SC

Card Types

11 12 16 17

21 26 27

31 32 34

Technical Directive
Compliance
Card Types

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

- Card Columns -

System Level Actions
(Off-Equipment Level-2
For Repair of Repairables)
NAF NO-3

Card Types

31 32 34

Technical Directive
Compliance
Card Types

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

- Card Columns -

System Level Actions
(On-Equipment Level-1
For Removal of Repairables)
NAF NO-1

Card Types

21 26 27

31 32 34

Technical Directive
Compliance
Card Types

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

- Card Columns -

System Level Actions
(On-Equipment Level-1
Without Removal of Repairables)
NAF-SC

Card Types

11 12 16 17

21 26 27

31 32 34

Technical Directive
Compliance
Card Types

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

- Card Columns -

Location
On Basic
Record

Block 30.3

Block 30.4

Block 30.5

Block 30.6

Block 30.7

Block 30.8 / 30.9
30.0

Block 40

Block 40.1

Block 40.2

Block 40.3

Block 40.4

Block 40.5

Work Started

Work Completed

To AMP

Off AMP

To AMP

Off AMP

Failed Material:

Action Taken

Mal.

Sanctity

Msg.

Part Number

A 42
N 43-45
N 46-47
AN 55-59
AN 60-74

55-58
N 59-62
N 63-66

AN 42
N 43-45
N 46-47
AN 55-59
AN 60-74

System Level Actions (On-Equipment Level-1 Without Removal of Repairables) MAF-SC				System Level Actions (On-Equipment Level-1 For Removal of Repairables) MAF MC-1				LRJ Level Actions (Off-Equipment Level 2 For Repair of Repairables) MAF MC-3				Technical Directive Compliance			
Location On Basic Record*	11	12	16	17	21	26	27	31	32	34	41	46	47		

*Block numbers in parentheses apply to TDC's card types 41, 46 and 47
 **Enter card type number in the blanks, i.e., 46 or 47

Card types numbered 11, 12, 41, 46, and 47 may contain either level-1, level-2 or level-3 data. A check on the maintenance-level codes in column 28, in accordance with notes pertaining to each file element, as appropriate -- is always necessary before transcribing a given data element into the MDCS-983 file.

The following list shows the groupings of MDCS-983 file data elements, by reference to data element numbers (with file position numbers, in parentheses), under headings which indicate the levels of maintenance that are the original source of data for each group:

<u>Level 1</u>	<u>Level 2</u>	<u>Levels 1 or 2</u>
8-74 (24-398)	75-189 (399-948)	1-7 (1-23)
190-219 (949-1042)	220-241 (1043-1112)	250-277 (1141-1224)
242-245 (1113-1126)	246-249 (1127-1140)	285-302 (1248)
	278-284 (1225-1247)	

2.2 Data-Element Redundancy and Data-Element Location on 3M CTs

Figure 2 shows the card-column locations of the various data elements on the various 3M system data cards. Notice the high degree of redundancy among the card-type data.

On any given data element (Horizontal) line, the CT with which the redundancy of information for the given element ends is indicated by a vertical line. This may be used as a guide in determining the number of choices of CTs from which a given data element can be obtained for transcription to the ARINC Research MDCS-983 file record format. The ARINC Research format is designed to eliminate these redundancies. It should be noted that the same data element may not be located in the same card column on all cards.

2.3 Assumptions Regarding Errors on CTS

Any 3M CTs having data entries not in agreement with the CT key-punch instructions* regarding mandatory entries (e.g., blanks where the instructions specify a mandatory entry) are assumed to be non-existent in the data received from MSO. MSO validation procedures, currently in effect**, should eliminate these errors. However, key-punch errors are expected to exist and verification checks under the various notes of this file format are intended to detect these, at least to the extent that they may be present in the basic job-identification data elements.

2.4 Modification of Blank Spaces in Certain CT Fields

In certain fields of the CTs, legitimate blanks (in accordance with 3M key-punch instructions) should be interpreted to mean numerical zero. These fields are:

<u>Card Columns</u>	<u>Card Types</u>
43-45, MAL Code	11, 21, 31
26-28, MAL Code	16, 17, 26, 27
46-47, IP	11, 12, 21, 31, 32, 41
48-51, MH	11, 21, 31, 41
52-54, EMT	11, 21, 31, 41
33-39, WUC	11, 12, 16, 17, 21, 26, 27, 31, 32
33-34, System	41, 46, 47

In addition, in the process of transcribing to the MDCS-983 file, certain spaces, dashes, and slant marks used merely for internal spacing in the following serial-number and part-number columns of cards will be eliminated (the digits will be closed to the standard interdigit spacing interval):

* See OPNAVINST 4790.2, Vol. IV, Chapter 4.

** Validation specification, MSO 4790.A2257-01, Change 1, 1 Jan 71; changed 16 Sept. 71.

Card Columns

45-54, Serial Number
12-21, Serial Number
60-74, Part Number
55-69, Manufacture Code
50-59, Serial Number

Card Types

16, 17, 26, 27
34
11, 12, 31, 32, 46, 47
16, 17, 26, 27
46, 47

Also, during the data transcription process, when positions within the above fields are found to be blank on the 3M computer cards, the blanks will be replaced by zeros when the data are entered in the MDCS-983 file.

2.5 Residue File

In any batch of data received from the Navy, some of the CT records pertaining to a given JCN may be missing. This can occur for several reasons, such as:

- (1) They were never key-punched.
- (2) They were removed from the batch (before shipping to ARINC Research) for correction and not yet reinserted -- in which case they may appear in a later batch received.
- (3) They have been lost or destroyed -- the originator may not have reported on the action, or part of the action, and no original source document exists to complete a maintenance-action history on some actions reported at the beginning.
- (4) The type of action for which certain file-record sections are reserved may not have occurred.

Therefore, the notes accompanying the ARINC Research data-file format have been designed to take account of missing data possibilities. The computer program for the transcription process allows for future update of the records if information is obtained at a date following the initial transcription date.

At the end of any record transcription run on a batch of data, any 3M card-type records remaining which could not be entered into the ARINC Research file (due to inability of the program to identify them with an appropriate record section, or because there is insufficient allocated record file space) will be stored on a Residue File tape and printed out on a Residue File Printout. This will make them available for further programmed processing and for manual analysis.

2.5.1 Residue File Codes

Codes will be assigned to all CT records sent to the Residue File in order to facilitate further processing, either for later entry into the MDCS-983 file, or for display purposes. The assigned codes will be entered on the CT records in residue in place of the "away" code, which is assigned card-column location 78 on all CTs. The away code is not used in ARINC Research analyses. (The away code is the only element of 3M data "lost" by this transcription process.) The following tabulation gives the codes which will be assigned to identify the purpose of CTs filed in residue:

<u>Code</u>	<u>Description</u>
1	Overflow condition - insufficient space in file section reserved for Level-1 primary work center MH and EMT at the close of an accounting period. See data elements 190-195; R.P. 949-970 (applies only to CT-11's, level-1 coded action taken N).
2	Overflow condition - insufficient space in file section reserved for level-1 primary work center MH and EMT stop-work accounting. See data elements 196-219, R.P. 971-1042 (applies only to CT-11's, level-1 coded action taken D, L, or M)
3.	Overflow condition - insufficient space in file section reserved for level-2 primary work center MH and EMT at the close of an accounting period. See data element 220-225; R.P. 1043-1064 (applies to CT-11's, level-2 coded action taken N or CT-31s coded action taken D).

<u>Code</u>	<u>Description</u>
4	Overflow condition - insufficient space in file section reserved for level-1 troubleshoot job data. See data elements 242-245; R.P. 1113-1126 (applies to CT-11s, level-1, coded action taken Y).
5	Overflow condition - insufficient space in file section reserved for level-2 troubleshoot job data. See data elements 246-249; R.P. 1127-1140 (applies to CT-11's, level-1 or level-2, coded action taken Y).
6	Overflow condition - insufficient space reserved for assisting Work Center Data. See data elements 250-263; R.P. 1160-1178 applies to CT-11's, level-1 or level-2).
7	Overflow condition - insufficient space in file section reserved for designated first assisting work center data at the close of an accounting period. See data elements 264-266; R.P. 1179-1189 (applies to CT-11's, level-1 or level-2 coded action taken N).
8	Overflow condition - insufficient space in file section reserved for designated second assisting work center data at the close of an accounting period. See data elements 267-269; R.P. 1190-1200 (applies only to CT-11;s, level-1 or level-2, coded action taken N).
9	Overflow condition - insufficient space in file section reserved for designated first assisting work center data reporting work stoppage actions. See data elements 270-273; R.P. 1201-1212 (applies only to CT-11's, level-1 or level-2, coded action taken D, L, or M and containing data issued by assisting work centers).
A	Overflow condition - insufficient space in file section reserved for designated second assisting work center data on work stoppage. See data elements 274-277 R.P. 1213-1224 (applies only to CT-11's, level-1 or level-2, coded action-taken D, L or M and containing data issued by assisting work centers).

<u>Code</u>	<u>Description</u>
B	<p>Overflow condition - insufficient space in file section reserved for data on end of accounting period MH and EMT from primary work center doing subassembly repair. See data elements 278-280; R.P. 1225-1235 (applies only to suffixed JCN CT-11's, level-2, coded action - taken N, and containing data issued by primary work centers acting on subassembly repairs).</p>
C	<p>A virtual overflow condition - the data cannot be filed in the section for first assisting work center data at the close of an accounting period due to a conflict between work center codes in the input data and data already filed under the following section of the file for work stoppage data. (Once input data records on two different assisting work centers have been designated by the programs as "first" and "second" work centers, the sections of the record reserved for data from those work centers are guarded to prevent entry of data by other work centers. Thus, even if "first" assisting work center data had entered only positions 1179-1189, for example, to show record of account period close; and if data from the "second" work center had entered only position 1190-1200, data on a third work center could not enter positions 1201-1212 or positions 1213-1224, even though they are empty, since these positions are reserved for the designated "first" and "second" work centers. Thus, there is a "virtual overflow" condition.) See, for example, data elements 264-266, R.P. 1179-1189, and D.E. 270-273, R.P. 1201-1212, both of which must refer to the same work center.</p>
D	<p>Virtual overflow condition - the data cannot be entered in the file due to a conflict between work center codes on CT's coded to indicate work stoppage data and data already filed under the file section reserved for man-hour data at account period close out. These two sections must contain data related to the same work center. See D.E. 270-273; R.P. 1201-1212 and D.E. 264-266; R.P. 1179-1189. (Also, see the corresponding following sections of the file labeled "second assisting work center").</p>

<u>Code</u>	<u>Description</u>
E	Overflow condition - insufficient space in file section for L-1 failed material. See D.E. 39-14; R.P. 219-398 (applies to L-1 CT 12's only)
F	Overflow condition - insufficient space in file section for L-2 failed material, non-suffixed JCN actions. See data elements 92-127; R.P. 458-637.
G	Overflow condition - insufficient space in file section for L-2 failed material, suffixed JCN actions. See data element 154-189; R.P. 757-948.
H	Data Identification Problem Condition - the code indicates a conflict between the action date already in file and the action date on the card in residue. This can occur when a JCN CT set is incomplete in the raw data. The date may have been transcribed from an L-2 CT-12 recording failed material required (AWP statues) at the time of stop work. Subsequently, a CT-11, for example, reporting the work stop man-hours/EMT may enter the transcription process. The CT-11 must have the same date as the CT-12 if it is to be identified as applicable to the same stoppage action as the previously read CT-12. See data element 227; R.P. 1066-1069.
I	Data Identification Problem Condition - this is a condition identical to that described under code H, except it applies to suffixed JCN records. See D.E. 282; R.P. 1237-1240.
J	Virtual overflow plus identification problem condition - the conditions applying to codes F and code H may apply simultaneously.
K	Virtual Overflow Plus Identification Problem Condition - the conditions applying to codes I and G may apply simultaneously.

<u>Code</u>	<u>Description</u>
L	<p>Actual or virtual overflow condition -</p> <p>(1) Insufficient space in file sections reserved for level-2 primary work center work stoppage data; see D.E. 226-241, R.P. 1065-1112, or</p> <p>(2) The work-stoppage action date has previously been transcribed to the file (positions 1066-1069) from a level-2 CT 12. A CT 11 or CT 31 following the CT 12 in the transcription process is found to have the same JCN, but different date. Thus, a virtual overflow condition exists if all other positions for recording the stop-work data in the file are already filled.</p>
M	<p>Virtual Overflow Condition -- same condition as described for Code L, except that it applies to suffixed JCN record positions for end-of-period accounting data and work-stoppage data. See Data Element 281-284, R.P. 1236-1247. Also, see preceding position D.E. 278-280, R.P. 1225-1235. Both of these sections must contain data pertaining to the same work center.</p>
N	<p>Overflow Condition - repair-cycle data beyond capacity of file record, if more than three cycles of AWP status were recorded. Also, the code is used to indicate the existence of a third AWP status cycle if at least three cycles have occurred. See D.E. 83-91, R.P. 422-457, and D.E. 144-153, R.P. 717-756 (applies to non-suffixed JCNs only).</p>
O	<p>Insufficient Identification - the CT does not contain adequate (numeric) information to allow identification of its data elements for correct filing. (Example: a CT 34 - which, by 3M system specification, has no type-equipment code - cannot enter the file if it is the only card present in the batch with its given JCN. It is required that a JCN record be established in the file from some other CT before a CT 34 can be correctly identified for filing.)</p>

The above residue file codes are used for automatic retrieval of data from the residue file when making data displays (when a CT has been sent to the residue file by the computer during a transcription run, an indicator is entered in the main file, D.E. 302, R.P. 1326-1329). They may also be used for manual review of the residue print-out. Correction of the main file may be accomplished via the punched card update provisions. The update feature is described in the following section's flow diagram.

2.6 Data Transcription Process Flow Diagram

After data on the as-received raw-data tapes are separated by type-equipment categories, as appropriate, the master tapes are sampled by printing at least one block of records to provide visual confirmation that the master tape contains the data expected. This step is illustrated in Figure 3.

The files can be corrected and updated by use of the record update cards file, processed via Utility Sort Routine No. 1, and the update file tape, as shown in the figure. The update tape is permanently retained as a record of all such update actions.

Entry of data into the file from the master tape is accomplished via Utility Sort Routine No. 2 and the card type (CT) Sequencing Program to the Main Transcription Program. This procedure arranges the original CT records in the correct priority order to ensure their transcription to the appropriate parts of the file record.

While the Main Transcription Program operates to produce the Latest File Tape, it also provides a print-out of any CT records which cannot enter the file record due to errors in the key-punched data. These CT records are printed along with the file record as it existed at the time the erroneous CT was being processed. This provides for comparison and identification of the error. If the error can be rectified through manual observation, a correction to the file can be made using the record update cards.

In addition, as shown by the figure, the main program produces a Residue File Tape. This tape, following a transcription run, will contain all CT record items which could not enter the file due to failure to meet criteria established for transcription of any data element.

For instance, in some cases the raw data tape may contain only a partial record of a given maintenance action. If certain CTs of a set pertaining to a maintenance action are missing from the raw data batch, it may be impossible to determine the correct file record position for some of the existing CT data elements. Such CT records are stored on the residue file tape and used as an input for next transcription run. If the missing records show up in a subsequent raw data tape, these, along with the residue file from previous transcriptions, can be used to construct a complete file record.

Each file record on which an overflow to the residue file has occurred is marked by entry in designated positions of the file. This procedure enables the use of all data reported when making counts of man-hours, maintenance actions, or other events, and ensures that all data correctly reported will be referenced and used even though some records may be incomplete.

The transcription runs with new raw-data inputs result in insertion of new complete records and completion of previous partial records into a new "latest" file tape, while the file tape input to the transcription program becomes the "previous" file tape, as indicated in Figure 3.

ARINC RESEARCH
MDCS-933 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
I. BASIC JOB IDENTIFICATION				
Job Control:				
1. Organization Initiating Action	1-3	11 or 12-11, 12, 16, 17, 21, 26, 27, 31, 32, 34, 41, 46, 47	1-3 (AN)	(1)
2. Date Action Was Initiated	4-7	11 or 12-11, 12, 16, 17, 21, 26, 27, 31, 32, 34, 41, 46, 47	4-7 (N)	(1)
3. Serial No. of Action	8-10	11 or 12-11, 12, 16, 17, 21, 26, 27, 31, 32, 34, 41, 46, 47	8-10 (AN)	(1)
4. Suffix	11	31, 12-11s, 12-12s, 32, 34,	11 (AN)	(1)
5. Original Document Designator	12-13	Any Card Used for D.E. 1-4	79-80 (N)	(2)
6. Type Equipment	14-17	Same as for D.E.5, but not 34s	12-15 (AN)	(1), (3)
7. BUNO/Serial No. of Aircraft	18-23	Same as for D.E.5, but not 34s	16-21 (AN)	(1), (3)
II. LEVEL-1, PRIMARY WORK CENTER DATA FOR END ITEM, OR SYSTEM, ACTIONS				
8. Action Organization, Level 1	24-26	11-11, 12, 16, 17, 21, 26, 27, 41, 46, 47	22-24	(1), (4)
9. Work Center, Level 1	27-29	11-11, 12, 21, 41, 46, 47	25-27 (AN)	(4A)
10. Action Date at Level 1	30-33	11-11, 12, 16, 17, 21, 26, 27, 41, 46, 47	29-32 (N)	(4E)
11. Date of Completion of Calendar Inspection	34-37	11-11s only	29-32	(4C)
12. Work Unit Code, System or IRU	38-44	11 or 12-11, 12, 16, 17, 21, 26, 27, 31, 32	33-39 (AN)	(1), (3A)
13. When Discovered Code, Level 1	45	11 or 12-11, 12, 21, 31, 32	40 (AN)	(1), (3A)
14. Type Maintenance Code, Level 1	46	11 or 12-11, 12, 21, 31, 32	41 (A)	(1), (3A)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
15. Action Taken at Level 1	47	L1-11,16,17,21,26,27	42 (AN) on 11, 21 25 (AN) on 16, 17,26,27	(4D)
16. Malfunction Code, Level 1	48-50	L1-11,16,17,21,26,27	43-45 (N) on 11,21, 26-28 (N) on 16,17,26,27	(4E)
17. Items Processed, Level 1	51-52	L1-11,21,41	46-47 (N)	(4A)
18. Man-Hours, Level 1	53-56	L1-11,21,41	48-51 (N)	(4B)
19. Elapsed Maintenance Time, Level 1	57-59	L1-11,12,41	52-54 (N)	(4B)
20. Svstem or LRU Reference Designator Code	60-62	None	None	(8)
Removed Items (LRU or System Parts From Systems) - Level 1 Repairs				
21. MFG. of Cannibalized Item Removed, Level 1	63-67	L1-11, or 16	55-59(AN) on 11 40-44(AN) on 16	(9)
22. MFG. of Item Removed to be Re- placed, Level 1	68-72	16,26,31	40-44(AN) or 16 & 26 55-59(AN) on 31	(10)
23. Serial Number of Removed Item, Level 1	73-82	16,26,34	45-54(AN) on 16 & 26 12-21(AN) on 34	(10A)
24. Part Number of Cannibalized Item, Level 1	83-97	L1-11,16	60-74(AN) on 11	(9)
25. Part Number of Removed Item, Level 1	98-112	16,26,31	55-69(AN) on 16 & 26	(10)
26. Time/Cycle of Removed Item, Level 1	113-117	16,26,34	70-74(AN) on 16 & 26 22-26(AN) on 34	(10A)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
27. System Configuration Baseline Code for Removed Items	118-121	None	None	(14)
28. Type Number for Removed Item	122-128	None	None	(13)
29. Configuration of System Worked on and Reference Designator for Re- moved Item	129-140	None	None	(15)
Installed Items (LRU or System Parts into System) - Level 1 Repairs				
30. MFG. of Item Installed After Cannibalization, Level 1	141-145	17 only	40-44 (AN)	(11)
31. MFG. of Installed Item, Level 1	146-150	17, 27	40-44 (AN)	(12)
32. Serial No. of Installed Item, Level 1	151-160	17, 27	45-54 (AN)	(12A)
33. Part No. of Installed Item After Cannibalization, Level 1	161-175	17 only	55-69 (AN)	(11)
34. Part No. of Installed Item, Level 1	176-190	17, 27	55-69 (AN)	(12)
35. Time/Cycle on Installed Item, Level 1	191-195	17, 27	70-74 (AN)	(12A)
36. System Configuration Baseline Code for Installed Item	196-199	None	None	(14A)
37. Type Number for Installed Item	200-206	None	None	(13A)
38. Reference Designator for Installed Item	207-218	None	None	(15A)
Failed Material from Level 1 Repairs of Systems				
39. Action Taken on Failed Material (1st Line Item on MAF Block 40)	219	L1-12 only	42 (A)	(16)
40. Malfunction Code on Failed Material (1st Line Item on MAF Block 40)	220-222	L1-12 only	43-45 (AN)	(16)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
41. Quantity of Failed Material (1st Line Item on MAF Block 40)	223-224	L1-12 only	46-47 (N)	(16)
42. Manufacturer of Failed Material (1st Line Item on MAF Block 40)	225-229	L1-12 only	55-59 (AN)	(16)
43. Part Number/Reference Symbol of Failed Material (1st Line Item on MAF Block 40)	230-244	L1-12 only	60-74 (AN)	(16)
44. ARINC Research Failed Material Code (1st Line Item on MAF Block 40)	245-248	None	None	(17)
45. Action Taken on Failed Material (2nd Line Item on MAF Block 40)	249	L1-12 only	42 (A)	(16)
46. Malfunction Code on Failed Material (2nd Line Item on MAF Block 40)	250-252	L1-12 only	43-45 (AN)	(16)
47. Quantity of Failed Material (2nd Line Item on MAF Block 40)	253-254	L1-12 only	46-47 (N)	(16)
48. Manufacturer of Failed Material (2nd Line Item on MAF Block 40)	255-259	L1-12 only	55-59 (AN)	(16)
49. Part No./Ref. Symbol of Failed Material (2nd Line Item on MAF Block 40)	260-274	L1-12 only	60-74 (AN)	(16)
50. ARINC Research Failed Material Code (2nd Line Item on MAF Block 40)	275-278	None	None	(17)
51. Action Taken on Failed Material (3rd Line Item on MAF Block 40)	279	L1-12 only	42 (A)	(16)
52. Malfunction Code on Failed Material (3rd Line Item on MAF Block 40)	280-282	L1-12 only	43-45 (AN)	(16)
53. Quantity of Failed Material (3rd Line Item on MAF Block 40)	283-284	L1-12 only	46-47 (N)	(16)
54. Manufacturer of Failed Material (3rd Line Item on MAF Block 40)	285-289	L1-12 only	55-59 (AN)	(16)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
55. Part No./Ref. Symbol of Failed Material (3rd Line Item on MAF Block 40)	290-304	L1-12 only	60-74 (AN)	(16)
56. ARINC Research Failed Material Code (3rd Line Item on MAF Block 40)	305-308	None	None	(17)
57. Action Taken on Failed Material (4th Line Item on MAF Block 40)	309	L1-12 only	42 (A)	(16)
58. Malfunction Code on Failed Material (4th Line Item on MAF Block 40)	310-312	L1-12 only	43-45 (AN)	(16)
59. Quantity of Failed Material (4th Line Item on MAF Block 40)	313-314	L1-12 only	46-47 (N)	(16)
60. Manufacturer of Failed Material (4th Line Item on MAF Block 40)	315-319	L1-12 only	55-59 (AN)	(16)
61. Part No./Ref. Symbol of Failed Material (4th Line Item on MAF Block 40)	320-334	L1-12 only	60-74 (AN)	(16)
62. ARINC Research Failed Material Code (4th Line Item on MAF Block 40)	335-338	None	None	(17)
63. Action Taken on Failed Material (5th Line Item on MAF Block 40)	339	L1-12 only	42 (A)	(16)
64. Malfunction Code on Failed Material (5th Line Item on MAF Block 40)	340-342	L1-12 only	43-45 (AN)	(16)
65. Quantity of Failed Material (5th Line Item on MAF Block 40)	343-344	L1-12 only	46-47 (N)	(16)
66. Manufacturer of Failed Material (5th Line Item on MAF Block 40)	345-349	L1-12 only	55-59 (AN)	(16)
67. Part No./Ref. Symbol of Failed Material (5th Line Item on MAF Block 40)	350-364	L1-12 only	60-74 (AN)	(16)
68. ARINC Research Failed Material Code (5th Line Item on MAF Block 40)	365-368	None	None	(17)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
69. Action Taken on Failed Material (6th Line Item on MAF Block 40)	369	L1-L2 only	42 (A)	(16)
70. Malfunction Code on Failed Material (6th Line Item on MAF Block 40)	370-372	L1-L2 only	43-45 (AN)	(16)
71. Quantity of Failed Material (6th Line Item on MAF Block 40)	373-374	L1-L2 only	46-47 (N)	(16)
72. Manufacturer of Failed Material (6th Line Item on MAF Block 40)	375-379	L1-L2 only	55-59 (AN)	(16)
73. Part No./Ref. Symbol of Failed Material (6th Line Item on MAF Block 40)	380-394	L1-L2 only	60-74 (AN)	(16)
74. ARINC Research Failed Material Code (6th Line Item on MAF Block 40)	395-398	None	None	(17)
III. INTERMEDIATE MAINTENANCE DATA (LEVEL 2) - (ACTIONS ON LRU's OR SYSTEM PARTS				
Maintenance Action Description				
75. Action Organization, L2	399-401	L2-11, 12, 31, 32, 41, 46, 47	22-24 (AN)	(18)
76. Work Center, L2	402-404	21, 32; L2-41, 46, 47	25-27 (AN)	(18F)
77. Action Date, L2	405-408	31, 32; L2-41, 46, 47	29-32 (N)	(18A)
78. Action Taken, L2	409	31 only	42 (AN)	(18B)
79. Malfunction Code, L2	410-412	31 only	43-45 (N)	(18C)
80. Items Processed, L2	413-414	31, L2-41	46-47 (N)	(18D)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
81. Man-Hours, L2	415-418	31, L2-41	48-51 (N)	(18E)
82. Elapsed Maintenance Time, L2	419-421	31, L2-41	52-54 (N)	(18E)
Repair Cycle Data (Level 2 - LRU or System Part Repairs)				
83. Date Removed from System	422-425	34 only	27-30 (N)	(19)
84. Date Received at Material Control	426-429	34 only	31-34 (N)	(19)
85. Date Work Started	430-433	34 only	35-38 (N)	(19)
86. Date Work Completed	434-437	34 only	39-42 (N)	(19)
87. Date to AWP (First)	438-441	34 only	43-46 (N)	(19)
88. Date off AWP (First)	442-445	34 only	47-50 (N)	(19)
89. Date to AWP (Second)	446-449	34 only	51-54 (N)	(19)
90. Date off AWP (Second)	450-453	34 only	55-58 (N)	(19)
91. ARINC Research Repair Cycle Notes	454-457	None	None	(20)
Failed Material from Level 2 Repairs of LRU or System Parts				
92. Action Taken on Failed Material (1st Line Item on MAF-MC3 Block 40)	458	32 only	42 (AN)	(16C)
93. Malfunction Code (1st Line Item on MAF-MC3 Block 40)	459-461	L2-12, 32	43-45 (N)	(16A)
94. Quantity of Failed Material (1st Line Item on MAF-MC3 Block 40)	462-463	32 only	46-47 (N)	(16C)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
95. MFG. of Failed Material (1st Line Item on MAF-MC3 Block 40)	464-468	L2-12, 32	55-59 (AN)	(16A)
96. Part Number of Failed Material (1st Line Item on MAF-MC3 Block 40)	469-483	L2-12, 32	60-74	(16A)
97. ARINC Research Failed Material Notes (1st Line Item on MAF-MC3 Block 40)	484-487	None	None	(17A)
98. Action Taken on Failed Material (2nd Line Item on MAF-MC3 Block 40)	488	32 only	42 (AN)	(16C)
99. Malfunction Code (2nd Line Item on MAF-MC3 Block 40)	489-491	L2-12, 32	43-45 (N)	(16A)
100. Quantity of Failed Material (2nd Line Item on MAF-MC3 Block 40)	492-493	32 only	46-47 (N)	(16C)
101. MFG. of Failed Material (2nd Line Item on MAF-MC3 Block 40)	494-498	L2-12, 32	55-59 (AN)	(16A)
102. Part No. of Failed Material (2nd Line Item on MAF-MC3 Block 40)	499-513	L2-12, 32	60-74 (AN)	(16A)
103. ARINC Research Failed Material Note (2nd Line Item on MAF-MC3 Block 40)	514-517	None	None	(17A)
104. Action Taken on Failed Material (3rd Line Item on MAF-MC3 Block 40)	518	32 only	42 (AN)	(16C)
105. Malfunction Code (3rd Line Item on MAF-MC3 Block 40)	519-521	L2-12, 32	43-45 (N)	(16A)
106. Quantity of Failed Material (3rd Line Item on MAF-MC3 Block 40)	522-523	32 only	46-47 (N)	(16C)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
107. MFG. of Failed Material (3rd Line Item on MAF-MC3 Block 40)	524-528	L2-12, 32	55-59 (AN)	(16A)
108. Part No. of Failed Material (3rd Line Item on MAF-MC3 Block 40)	529-543	L2-12, 32	60-74 (AN)	(16A)
109. ARINC Research Failed Material Note (3rd Line Item on MAF-MC3 Block 40)	544-547	None	None	(17A)
110. Action Taken on Failed Material (4th Line Item on MAF-MC3 Block 40)	548	32 only	42 (AN)	(16C)
111. Malfunction Code (4th Line Item on MAF-MC3 Block 40)	549-551	L2-12, 32	43-45 (N)	(16A)
112. Quantity of Failed Material (4th Line Item on MAF-MC3 Block 40)	552-553	32 only	46-47 (N)	(16C)
113. MFG. of Failed Material (4th Line Item on MAF-MC3 Block 40)	554-558	L2-12, 32	55-59 (AN)	(16A)
114. Part No. of Failed Material (4th Line Item on MAF-MC3 Block 40)	559-573	L2-12, 32	60-74 (AN)	(16A)
115. ARINC Research Failed Material Note (4th Line Item on MAF-MC3 Block 40)	574-577	None	None	(17A)
116. Action Taken on Failed Material (5th Line Item on MAF-MC3 Block 40)	578	32 only	42 (AN)	(16C)
117. Malfunction Code (5th Line Item on MAF-MC3 Block 40)	579-581	L2-12, 32	43-45 (N)	(16A)
118. Quantity of Failed Material (5th Line Item on MAF-MC3 Block 40)	582-583	32 only	46-47 (N)	(16C)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
119. MFG. of Failed Material (5th Line Item on MAF-MC3 Block 40)	584-588	L2-12, 32	55-59 (AN)	(16A)
120. Part No. of Failed Material (5th Line Item on MAF-MC3 Block 40)	589-603	L2-12, 32	60-74 (AN)	(16A)
121. ARINC Research Failed Material Note (5th Line Item on MAF-MC3 Block 40)	604-607	None	None	(17A)
122. Action Taken on Failed Material (6th Line Item on MAF-MC3 Block 40)	608	32 only	42 (AN)	(16C)
123. Malfunction Code (6th Line Item on MAF-MC3 Block 40)	609-611	L2-12, 32	43-45 (N)	(16A)
124. Quantity of Failed Material (6th Line Item on MAF-MC3 Block 40)	612-613	32 only	46-47 (N)	(16C)
125. MFG. of Failed Material (6th Line Item on MAF-MC3 Block 40)	614-618	L2-12, 32	55-59 (AN)	(16A)
126. Part No. of Failed Material (6th Line Item on MAF-MC3 Block 40)	619-633	L2-12, 32	60-74 (AN)	(16A)
127. ARINC Research Failed Material Note (6th Line Item on MAF-MC3 Block 40)	634-637	None	None	(17A)
TV. INTERMEDIATE MAINTENANCE DATA (LEVEL 2) - SUBASSEMBLY OR LRU PART ACTIONS				
Maintenance Action Description				
128. Action Organization for Subassembly Repair	638-640	L2-11, 12, 31, 32	22-24 (AN)	(22)
129. Work Center for Subassembly Repair	641-643	31, 32	25-27 (AN)	(22)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
130. Action Date for Subassembly	644-647	31, 32	29-32 (AN)	(22E)
131. Work Unit Code for Subassembly	648-654	L2-11, 12, 31, 32	33-39 (AN)	(22)
132. When Discovered Code for Sub-assembly)	655	L2-11, 12, 31, 32	40 (AN)	(22)
133. Type Maintenance for Subassembly	656	L2-11, 12, 31, 32	41 (A)	(22)
134. Action Taken on Subassembly	657	31 only	42 (AN)	(22C)
135. Malfunction Description for Sub-assembly	658-660	31 only	43-45 (AN)	(22D)
136. Items Processed, Subassembly	661-662	31 only	46-47 (N)	(22C)
137. Man-Hours on Subassembly Repair	663-666	31 only	48-51 (N)	(22A)
138. EMT for Subassembly Repair	667-669	31 only	52-54 (N)	(22A)
139. Manufacturer of Subassembly	670-674	31 only	55-59 (AN)	(22C)
140. Part Number of Subassembly	675-689	31 only	60-74 (AN)	(22C)
141. Serial Number of Subassembly	690-699	34 only	12-21 (AN)	(23)
142. Time/Cycles for Subassembly	700-704	34 only	22-26 (AN)	(23)
143. Reference Designator for Sub-Assembly	705-716	None	None	(15E)
Repair Cycle Data - Level 2 Subassembly or LRU Part Repairs				
144. Date of Removal of Subassembly from LRU	717-720	34 only	27-30 (N)	(23)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
145. Date of Receipt of Subassembly At Material Control Station	721-724	34 only	31-34 (N)	(23)
146. Date Subassembly Work Started	725-728	34 only	35-38 (N)	(23)
147. Date Subassembly Work Completed	729-732	34 only	39-42 (N)	(23)
148. Date to AWP (First)	733-736	34 only	43-46 (N)	(23)
149. Date off AWP (First)	737-740	34 only	47-50 (N)	(23)
150. Date to AWP (Second)	741-744	34 only	51-54 (N)	(23)
151. Date off AWP (Second)	745-748	34 only	55-58 (N)	(23)
152. Date to AWP (Third)	749-752	34 only	59-62 (N)	(23)
153. Date off AWP (Third)	753-756	34 only	63-66	(23)
<u>Failed Material (Level 2) - Piece Parts from Subassemblies or LRU Parts</u>				
154. Action Taken on Material (1st Line Item on Suffixed MAF-MC3 Block 40)	757	32 only	42 (AN)	(16D)
155. Malfunction Code (1st Line Item on Suffixed MAF-MC3 Block 40)	758-760	L2-12, 32	43-45 (AN)	(16B)
156. Quantity of Failed Material (1st Line Item on Suffixed MAF-MC3 Block 40)	761-762	32 only	46-47 (N)	(16D)
157. MFG. Of Failed Material (1st Line Item on Suffixed MAF-MC3 Block 40)	763-767	L2-12, 32	55-59 (AN)	(16B)
158. Part No. of Failed Material (1st Line Item on Suffixed MAF-MC3 Block 40)	768-782	L2-12, 32	60-74 (AN)	(16B)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
159. ARINC Research Failed Material Note (1st Line Item on Suffixed MAF-MC3 Block 40)	783-788	None	None	(17E)
160. Action Taken on Failed Material (2nd Line Item on Suffixed MAF- MC3 Block 40)	789	32 only	42 (AN)	(16D)
161. Malfunction Code (2nd Line Item on Suffixed MAF-MC3 Block 40)	790-792	L2-12, 32	43-45 (AN)	(16E)
162. Quantity of Failed Material (2nd Line Item on Suffixed MAF-MC3 Block 40)	793-794	32 only	46-47 (N)	(16D)
163. MFG. of Failed Material (2nd Line Item on Suffixed MAF-MC3 Block 40)	795-799	L2-12, 32	55-59 (AN)	(16B)
164. Part No. of Failed Material (2nd Line Item on Suffixed MAF-MC3 Block 40)	800-814	L2-12, 32	60-74 (AN)	(16B)
165. ARINC Research Failed Material Note (2nd Line Item on Suffixed MAF-MC3 Block 40)	815-820	None	None	(17E)
166. Action Taken on Material (3rd Line Item on Suffixed MAF-MC3 Block 40)	821	32 only	42 (AN)	(16D)
167. Malfunction Code (3rd Line Item on Suffixed MAF-MC3 Block 40)	822-824	L2-12, 32	43-45 (AN)	(16E)
168. Quantity of Failed Material (3rd Line Item on Suffixed MAF-MC3 Block 40)	825-826	32 only	46-47 (N)	(16D)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
169. MFG. of Failed Material (3rd Line Item on Suffixed MAF-MC3 Block 40)	827-831	I2-12, 32	55-59 (AN)	(16B)
170. Part No. of Failed Material (3rd Line Item on Suffixed MAF-MC3 Block 40)	832-846	I2-12, 32	60-74 (AN)	(16B)
171. ARINC Research Failed Material Note (3rd Line Item on Suffixed MAF-MC3 Block 40)	847-852	None	None	(17B)
172. Action Taken on Failed Material (4th Line Item on Suffixed MAF-MC3 Block 40)	853	32 only	42 (AN)	(16D)
173. Malfunction Code (4th Line Item on Suffixed MAF-MC3 Block 40)	854-856	I2-12, 32	43-45 (AN)	(16B)
174. Quantity of Failed Material (4th Line Item on Suffixed MAF-MC3 Block 40)	857-858	32 only	46-47 (N)	(16D)
175. MFG. of Failed Material (4th Line Item on Suffixed MAF-MC3 Block 40)	859-863	I2-12, 32	55-59 (AN)	(16B)
176. Part No. of Failed Material (4th Line Item on Suffixed MAF-MC3 Block 40)	864-878	I2-12, 32	60-74 (AN)	(16B)
177. ARINC Research Failed Material Note (4th Line Item on Suffixed MAF-MC3 Block 40)	879-884	None	None	(17B)
178. Action Taken on Material (5th Line Item on Suffixed MAF-MC3 Block 40)	885	32 only	42 (AN)	(16D)
179. Malfunction Code (5th Line Item on Suffixed MAF-MC3 Block 40)	886-888	I2-12, 32	43-45 (AN)	(16B)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
180. Quantity of Failed Material (5th Line Item on Suffix MAF-MC3 Block 40)	889-890	32 only	46-57 (AN)	(16C)
181. MFG. of Failed Material (5th Line Item on Suffix MAF-MC3 Block 40)	891-895	L2-12, 32	55-59 (AN)	(16E)
182. Part No. of Failed Material (5th Line Item on Suffix MAF-MC3 Block 40)	896-910	L2-12, 32	60-74 (AN)	(16E)
183. ARINC Research Failed Material Note (5th Line Item on Suffix MAF-MC3 Block 40)	911-916	None	None	(17E)
184. Action Taken on Failed Material (6th Line Item on Suffix MAF-MC3 Block 40)	917	32 only	42 (AN)	(16D)
185. Malfunction Code (6th Line Item on Suffix MAF-MC3 Block 40)	918-920	L2-12, 32	43-45 (AN)	(16E)
186. Quantity of Failed Material (6th Line Item on Suffix MAF-MC3 Block 40)	921-922	32 only	46-47 (AN)	(16D)
187. MFG. of Failed Material (6th Line Item on Suffix MAF-MC3 Block 40)	923-927	L2-12, 32	55-59 (AN)	(16E)
188. Part No. of Failed Material (6th Line Item on Suffix MAF-MC3 Block 40)	928-942	L2-12, 32	60-74 (AN)	(16E)
189. ARINC Research Failed Material Note (6th Line Item on Suffix MAF-MC3 Block 40)	943-948	None	None	(17E)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
V. LEVEL 1 - PRIMARY WORK CENTER AND LEVEL 2 - WORK CENTER MAN-HOURS ACCOUNTING (WHILE WORK CONTINUES) AND WORK STOPPAGE MAN-HOURS ACCOUNT- ING DATA				
190. (First, Level 1) Man-Hours Account- ing Action Date to Close Accounting Period	949-952	L1-11 only	29-32 (N)	(26)
191. (First, Level 1) Man-Hours at Accounting Closeout Date	953-956	L1-11 only	48-51 (N)	(26B)
192. (First, Level 1) EMT at Accounting Closeout Date	957-959	L1-11 only	52-54 (N)	(26B)
193. (Second, Level 1) Man-Hours Account- ing Action Date to Close Accounting Period	960-963	L1-11 only	29-32 (N)	(26A)
194. (Second, Level 1) Man-Hours at Accounting Closeout Date	964-967	L1-11 only	48-51 (N)	(26C)
195. (Second, Level 1) EMT at Accounting Closeout Date	968-970	L1-11 only	52-54 (N)	(26C)
196. (First, Level 1) Work Stoppage Code	971	L1-11 only	42 (AN)	(27)
197. (First, Level 1) Work Stoppage Action Date	972-975	L1-11 only	29-32 (N)	(27F)
198. (First, Level 1) Man-Hours at Work Stoppage Date	976-979	L1-11 only	48-51 (N)	(27F)
199. (First, Level 1) EMT at Work Stoppage Date	980-982	L1-11 only	52-54 (N)	(27F)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
200. (Second, Level 1) Work Stoppage Code	983	L1-11 only	42 (AN)	(27A)
201. (Second, Level 1) Work Stoppage Action Date	984-987	L1-11 only	29-32 (N)	(27G)
202. (Second, Level 1) Man-Hours at Work Stoppage Date	988-991	L1-11 only	48-51 (N)	(27G)
203. (Second, Level 1) EMT at Work Stoppage Date	992-994	L1-11 only	52-54 (N)	(27G)
204. (Third, Level 1) Work Stoppage Code	995	L1-11 only	42 (AN)	(27E)
205. (Third, Level 1) Work Stoppage Action Date	996-999	L1-11 only	29-32 (N)	(27H)
206. (Third, Level 1) Man-Hours at Work Stoppage Date	1000-1003	L1-11 only	48-51 (N)	(27H)
207. (Third, Level 1) EMT at Work Stoppage Date	1004-1006	L1-11 only	52-54 (N)	(27H)
208. (Fourth, Level 1) Work Stoppage Code	1007	L1-11 only	42 (AN)	(27C)
209. (Fourth, Level 1) Work Stoppage Action Date	1008-1011	L1-11 only	29-32 (N)	(27I)
210. (Fourth, Level 1) Man-Hours at Work Stoppage Date	1012-1015	L1-11 only	48-51 (N)	(27I)
211. (Fourth, Level 1) EMT at Work Stoppage Date	1016-1018	L1-11 only	52-54 (N)	(27I)
212. (Fifth, Level 1) Work Stoppage Code	1019	L1-11 only	42 (AN)	(27D)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
213. (Fifth, Level 1) Work Stoppage Action Date	1020-1023	L1-11 only	29-32 (N)	(27J)
214. (Fifth, Level 1) Man-Hours at Work Stoppage Date	1024-1027	L1-11 only	48-51 (N)	(27J)
215. (Fifth, Level 1) EMT at Work Stoppage Date	1028-1030	L1-11 only	52-54 (N)	(27J)
216. (Sixth, Level 1) Work Stoppage Code	1031	L1-11 only	42 (AN)	(27E)
217. (Sixth, Level 1) Work Stoppage Action Date	1032-1035	L1-11 only	29-32 (N)	(27K)
218. (Sixth, Level 1) Man-Hours at Work Stoppage Date	1036-1039	L1-11 only	48-51 (N)	(27K)
219. (Sixth, Level 1) EMT at Work Stoppage Date	1040-1042	L1-11 only	52-54 (N)	(27K)
220. (First, Level 2) Man-Hours Account- ing Action Date to Closeout Accounting Period	1043-1046	L2-11 only	29-32 (N)	(29)
221. (First, Level 2) Man-Hours at Accounting Period Closeout Date	1047-1050	L2-11 only	48-51 (N)	(29B)
222. (First, Level 2) EMT at Accounting Period Closeout Date	1051-1053	L2-11 only	52-54 (N)	(29E)
223. (Second, Level 2) Man-Hours Account- ing Action Date to Closeout Account- ing Period	1054-1057	L2-11 only	29-32 (N)	(29A)
224. (Second, Level 2) Man-Hours at Accounting Period Closeout Date	1058-1061	L2-11 only	48-51 (N)	(29C)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
225. (Second, Level 2) EMT Accounting Period Closeout Date	1062-1064	L2-11 only	52-54 (N)	(29C)
226. (First, Level 2) Work Stoppage Code	1065	L2-11, 31	42 (AN)	(30)
227. (First, Level 2) Work Stoppage Action Date	1066-1069	L2-11, 12, 31	29-32 (N)	(31)
228. (First, Level 2) Man-Hours at Work Stoppage Date	1070-1073	L2-11, 31	48-51 (N)	(30D)
229. (First, Level 2) EMT at Work Stop- page Date	1074-1076	L2-11, 31	52-54 (N)	(30D)
230. (Second, Level 2) Work Stoppage Code	1077	L2-11, 31	42 (AN)	(30A)
231. (Second, Level 2) Work Stoppage Action Date	1078-1081	L2-11, 12, 31	29-32 (N)	(31A)
232. (Second, Level 2) Man-Hours at Work Stoppage Date	1082-1085	L2-11, 31	48-51 (N)	(30E)
233. (Second, Level 2) EMT at Work Stoppage Date	1086-1088	L2-11, 31	52-54 (N)	(30E)
234. (Third, Level 2) Work Stoppage Code	1089	L2-11, 31	42 (AN)	(30E)
235. (Third, Level 2) Work Stoppage Action Date	1090-1093	L2-11, 12, 31	29-32 (N)	(31E)
236. (Third, Level 2) Man-Hours at Work Stoppage Date	1094-1097	L2-11, 31	48-51 (N)	(30F)
237. (Third, Level 2) EMT at Work Stop- page Date	1098-1100	L2-11, 31	52-54 (N)	(30F)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
238. (Fourth, Level 2) Work Stoppage Code	1101	L2-11, 31	42 (AN)	(30C)
239. (Fourth, Level 2) Work Stoppage Action Date	1102-1105	L2-11, 12, 31	29-32 (N)	(31C)
240. (Fourth, Level 2) Man-Hours at Work Stoppage Date	1106-1109	L2-11, 31	48-51 (N)	(30G)
241. (Fourth, Level 2) EMT at Work Stoppage Date	1110-1112	L2-11, 31	52-54 (N)	(30G)
VI. TROUBLESHOOTING (T.S.) TIME DATA - MAINTENANCE LEVEL 1				
242. T.S. Malfunction Code	1113-1115	L1-11 only	43-45 (N)	(32)
243. T.S. Action Date	1116-1119	L1-11 only	29-32 (N)	(32A)
244. T.S. Man-Hours	1120-1123	L1-11 only	48-51 (N)	(32A)
245. T.S. EMT (Hours)	1124-1126	L1-11 only	52-54 (N)	(32A)
VII. TROUBLESHOOTING (T.S.) TIME DATA - MAINTENANCE LEVEL 2				
246. T.S. Malfunction Code	1127-1129	L2-11 only	43-45 (N)	(32B)
247. T.S. Action Date	1130-1133	L2-11 only	29-32 (N)	(32C)
248. T.S. Man-Hours	1134-1137	L2-11 only	48-51 (N)	(32C)
249. T.S. EMT (Hours)	1138-1140	L2-11 only	52-54 (N)	(32C)
VIII. ASSISTING WORK CENTER ACTIONS				
250. Action Organization (First Assisting WC)	1141-1143	L1 or L2-11	22-24 (AN)	(32)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
251. Assisting Work Center Code (First Assisting WC)	1144-1146	L1 or L2-11	25-27 (AN)	(33E)
252. Assisting Work Center Maintenance Level (First Assisting Center)	1147	L1 or L2-11	28 (N)	(33E)
253. First Assisting Work Center Action Taken Code	1148	L1 or L2-11	42 (AN)	(33E)
254. First Assisting Work Center Action Date	1149-1152	L1 or L2-11	29-32 (N)	(33E)
255. First Assisting Work Center Man- Hours	1153-1156	L1 or L2-11	48-51 (N)	(33E)
256. First Assisting Work Center EMT (Hours)	1157-1159	L1 or L2-11	52-54 (N)	(33E)
257. Action Organization (Second Assist- ing WC)	1160-1162	L1 or L2-11	22-24 (AN)	(33A)
258. Assisting Work Center Code (Second Assisting WC)	1163-1165	L1 or L2-11	25-27 (AN)	(33C)
259. Assisting Work Center Maintenance Level (Second Assisting Center)	1166	L1 or L2-11	28 (N)	(33C)
260. Second Assisting Work Center Action Taken Code	1167	L1 or L2-11	42 (AN)	(33C)
261. Second Assisting Work Center Action Date	1168-1171	L1 or L2-11	29-32 (N)	(33C)
262. Second Assisting Work Center Man- Hours	1172-1175	L1 or L2-11	48-51 (N)	(33C)
263. Second Assisting Work Center EMT (Hours)	1176-1178	L1 or L2-11	52-54 (N)	(33C)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
IX. ASSISTING WORK CENTERS - MAN-HOUR ACCOUNTING (WHILE WORK CONTINUES) AND WORK STOPPAGE MAN-HOUR ACCOUNT- ING DATA				
264. Man-Hour Accounting Action Date (First Assisting WC) to Close Accounting Period	1179-1182	L1 or L2-11	29-32 (N)	(34)
265. Man-Hours at Account Period Close- Out (First Assisting WC)	1183-1186	L1 or L2-11	48-51 (N)	(34B)
266. EMT at Account Period Closeout (First Assisting WC)	1187-1189	L1 or L2-11	52-54 (N)	(34B)
267. Man-Hour Accounting Action Date (Second Assisting WC) to Close Accounting Period	1190-1193	L1 or L2-11	29-32 (N)	(34A)
268. Man-Hours at Account Period Close- Out (Second Assisting WC)	1194-1197	L1 or L2-11	48-51 (N)	(34C)
269. EMT at Account Period Closeout (Second Assisting WC)	1198-1200	L1 or L2-11	52-54 (N)	(34C)
270. Work Stoppage Action Taken Code (First Assisting WC)	1201	L1 or L2-11	42 (AN)	(35)
271. Work Stoppage Action Date (First Assisting WC)	1202-1205	L1 or L2-11	29-32 (N)	(35B)
272. Man-Hours at Work Stoppage (First Assisting WC)	1206-1209	L1 or L2-11	48-51 (N)	(35B)
273. EMT at Work Stoppage Date (First Assisting WC)	1210-1212	L1 or L2-11	52-54 (N)	(35B)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
274. Work Stoppage Action Taken Code (Second Assisting WC)	1213	L1 or L2-11	42 (AN)	(35A)
275. Work Stoppage Action Date (Second Assisting WC)	1214-1217	L1 or L2-11	29-32 (N)	(35C)
276. Man-Hours at Work Stoppage Date (Second A sisting WC)	1218-1221	L1 or L2-11	48-51 (N)	(35C)
277. EMT at Work Stoppage Date (Second Assisting WC)	1222-1224	L1 or L2-11	52-54 (N)	(35C)
X. DATA ON LEVEL-2 MAN-HOUR ACCOUNTING (WHILE WORK CONTINUES) AND WORK STOPPAGE DURING SUBASSEMBLY REPAIR				
278. Subassembly Repair Work Center's Man-Hour Accounting Action Date to Close Accounting Period	1225-1228	L2-11 only	29-32 (N)	(36)
279. Man-Hours for Subassembly Repair WC to Close Accounting Period	1229-1232	L2-11 only	48-51 (N)	(36A)
280. EMT for Subassembly Repair WC to Close Accounting Period	1233-1235	L2-11 only	52-54 (N)	(36A)
281. Subassembly Repair - Work Stoppage Action Taken Code	1236	L2-11, 31	42 (AN)	(37)
282. Work Stoppage on Subassembly Repair Action Date	1237-1240	L2-11, 12, 31	29-32 (N)	(37A)
283. Man-Hours at Subassembly Repair Work Stoppage Action Date	1241-1244	L2-11, 31	48-51 (N)	(37B)
284. EMT at Subassembly Repair Work Stoppage Action Date	1245-1247	L2-11, 31	52-54 (N)	(37E)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
XI. TECHNICAL DIRECTIVE COMPLIANCE (TDC) DATA				
285. TDC Maintenance Level	1248	L1 or L2, 41, 46, 47	28	(39)
286. System on Which TDC is Reported	1249-1250	L1 or L2, 41, 46, 47	33-34 (N)	(39)
287. TDC Status	1251	L1 or L2, 41, 46, 47	42 (A)	(39)
288. Interim Directive Indicator	1252	L1 or L2, 41 only	55 (A)	(39B)
TDC NUMBER				
289. Code	1253-1254	L1 or L2-41 only	56-57 (N)	(39B)
290. Basic Number	1255-1258	L1 or L2-41 only	58-61 (N)	(39B)
291. Revision	1259	L1 or L2-41 only	62 (N)	(39B)
292. Amendment	1260	L1 or L2-41 only	63 (N)	(39B)
293. Part	1261-1262	L1 or L2-41 only	64-65 (N)	(39B)
294. Kit	1263-1264	L1 or L2-41 only	66-67 (N)	(39B)
295. TDC Data Processing Correction Code (First Character)	1265	L1 or L2-41, 46	75 (N)	(39A)
TDC "OLD ITEM"				
296. Old Item Mfr. Code	1266-1270	L1 or L2 - 46 only	45-49 (AN)	(40)
297. Old Item Serial Number	1271-1280	L1 or L2 - 46 only	50-59 (AN)	(40)
298. Old Item Part Number	1281-1295	L1 or L2 - 46 only	60-74 (AN)	(40)

ARINC RESEARCH
MDCS-983 DATA FILE FORMAT

Data Elements	ARINC Research Record Position	Selectable 3M-MDCS Card Types (See Notes)	3M C.T. COL.	Notes
TDC "NEW ITEM"				
299. New Item Mfr. Code	1296-1300	L1 or L2 - 47 only	45-49 (AN)	(41)
300. New Item Serial Number	1301-1310	L1 or L2 - 47 only	50-59 (AN)	(41)
301. New Item Part Number	1311-1325	L1 or L2 - 47 only	60-74 (AN)	(41)
XII. DATA IN RESIDUE FILE				
302. Record Overflow Indicator	1326-1329	None	None	(38)

ARINC RESEARCH MDCS-983 DATA FILE FORMAT NOTES

(See the "General Processing Remarks" before interpreting these notes)

1. (Ref. Record Position (R.P.) 1-11; Data Elements (D.E.) 1-4).
In any batch of data to be transcribed, the elements for transcription to these positions may be obtained from any of the card types (CT) which are listed in the third column. See the general processing remarks for special procedures on processing CTs having "action-taken" codes D, L, M, N, or Y.

When a selected CT contains "action-taken" codes D, L, M, N, or Y, and there are other CTs in the raw data batch which have the same JCN, there are circumstances under which the D, L, M, N and Y coded CTs should not be used for initial transcription of the maintenance record without special precautions. Beyond the transcription of the "JCN", "Type Equipment," "BU/Ser," "Action Organization" and original document designator codes, steps should be taken to assure that CTs having action-taken codes other than these are examined and transcribed first. Otherwise, the data from the D, L, M, N, or Y coded cards may be placed in the wrong record positions.

The proper sequencing of the D, L, M, N, or Y coded records can be assured during the transcription process by sorting the raw data 3-M cards such that the cards with these codes enter the process last within each JCN present in the batch.

(NOTE: Data elements 8 and 9 and subsequent data elements through number 74 and selected other data elements in later sections of the MDCS-983 file format are designed to contain data originated by the maintenance-level 1, primary work center only. However, some of this information is redundantly included on other maintenance-level source documents. These items may be obtained from level-2 CTs.

Failure to observe the restrictions presented in the notes pertaining to each data element can result in a data element's positions containing data originated by a work center other than the primary level-1, center. Likewise, data elements 75-82 and selected data elements in later sections of the file format pertain to the level-2 primary work center only. Failure to correctly utilize the raw-data CTs during transcription according to the pertinent notes can result in the misplacement of data to these file-record positions.

Preferably, in order to minimize processing time, the transcription of a record should be initiated using CTs 11, 21, 31, or 41 since the maximum number of basic job descriptive data elements, needed in later record file positions, are contained on these CTs. If the use of other CTs is necessary because of the absence of the above types within any given JCN, the others should be arranged for processing in the following priority ordering:

- (a) If any maintenance level-1 (L-1) CT 12 and/or 16, and/or 17 are present without an L-1 CT 11 having matching JCN (including suffix) being present, the appropriate positions should be filled from one such as these selected in ascending order by CT number present. All of these which are associated with the same specific job are identified by the same JCN.
- (b) If any CT 26 and/or 27 are present without a CT 21 having matching JCN (including suffix) being present, the appropriate positions should be filled from one such as these selected in ascending order by CT number present. All of these which are associated with the same specific job are identified by the same JCN, but one different from the CT 11, 12, 16 and 17 JCN.
- (c) If any CT 31 and/or 32, and/or 34 are present without CT 21 and/or 26 and/or 27 having matching JCN (including suffix) being present, the appropriate positions should

be filled from one such as these selected in ascending order by CT number present. Under a given specific job these cards will be identified by the same JCN which appears on the 21, 26, and 27 CTs for that job.

- (d) The 41, 46, and 47 CTs are a separate class. Their common JCN for a specific job will not appear on CTs of the other series. CTs 46 and 47 may be used for certain data elements which are redundant to data on the CT 41s.

Notice that when a transcribed JCN has no suffix, record position 11 will be blank. After a selected CT has been used to transcribe record file data elements 1-7 (R.P. 1-23), its further usefulness is dependent upon the specific notes pertaining to subsequent data elements.

2. (Reference: RP 12-13, D.E. 5). Record the card type number of the 3M card from which the data in Positions 1 through 11 (JCN) were originally transcribed.

3. (Reference: R.P. 14-23, D.E. 6 and 7). Transcribe from any CT except a CT 34, which does not contain this element. In the event the JCN has been transcribed from a CT 34 leave this position blank to be filled from CT's which may be present in this batch of data or in batches of data to be transcribed in the future (see the General Processing Remarks).

3A. (Reference: R.P. 38-46; D.E. 12-14). Transcribe as in note 3 except:

- (1) The selected CT (if a CT 11, or 12, 31 or 32) must be checked to assure that it has a non-suffixed JCN.
- (2) The CT priority ordering pertaining to DLMN or Y action taken codes described under note 1, does not apply to CT 12, which has no action taken code; but the CT must be non-suffixed.
- (3) This data element can not be transcribed from CTs 41, 46, or 47 since they do not contain this element.

4. (Reference R.P. 24-26; D.E. 8) Transcribe from a CT document which contains the JCN previously transcribed as data element No. 1, provided:

- (1) It is a level-1 CT.
- (2) If it contains action taken codes DLMN or Y, it appears in the correct priority ordering for these CTs as specified under Note 1.
- (3) The selected CT is one which contains the data (see the third column of the format sheet).

4A. (Reference R.P. 27-29, 51-52; D.E. 9, 17). Transcribe as in Note 4, except that, if the selected raw data card is a CT-11, check for an alphabetic character in column 8 of the JCN serial number columns (8-10) of the CT. If there is none and the "Items Processed" column indicates other than zero, proceed with the transcription of this data element.

If a selected CT-11 contains an alphabetic first character, as described above, followed by zeros, as second and third characters (columns 9 and 10 of the CT), check the "Action Taken" and "Items Processed" columns of the CT. If these columns (collectively) indicate quantities of "zero" and "one", respectively, proceed with the transcription of this data element. Otherwise, leave these positions blank to be filled in from other CTs in this or a subsequent batch of data.

If a selected CT-11 contains an alphabetic first character and non-zero (including alphabetic character) in any of the second or third character positions of the JCN serial number (Columns 8-10), proceed with transcription of the data element, except when the card's coding indicates zero Items Processed.

4B. (Reference R.P. 30-33, 53-59; D.E. 10, 18, and 19). Transcribe as in note 4, except that in the case of a selected CT" it must not contain action-taken codes D, L, M, N, or Y. Also, in addition to checking

for maintenance level 1, check the digit under the "Man-Hours" columns of the selected CT . Transcribe this data element only if there are non-zero digits in any of the "Man-Hours" columns and the work center is the same as that previously recorded under data-element 9 (see note 4A).

4C. (Reference: R.P. 34-37; D.E. 11). Transcribe as in note 4, except add the following paragraphs:

Transcribe this data element only from level -1 CT 11s which have a JCN serial number (Columns 8-10) consisting of an alphabetic first character followed by zero second and third characters.

If the above conditions exist, check the digits under the "Man-Hours" columns on the CT. If all the digits in the "Man-Hours" columns are zero, proceed with the transcription of this data element, provided the "Work Center" code is the same as that previously recorded under data element 9. Otherwise, the data element's positions will be left blank.

Do not transcribe this data element from CTs containing action-taken codes D, L, M, N, or Y.

4D. (Reference: R.P. 47; D.E. 15) Same as note 4A, except that if selected CT must not contain action-taken codes "D, L, M, N, or Y".

4E. (Reference: R.P. 48-50; D. E. 16). Same as note 4A, except that if the selected CT is an 11 card, its action-taken code must be other than "Y".

5. This note number is unused, intentionally.

6. This note number is unused, intentionally.

7. This note number is unused, intentionally.

8. (Reference: R.P. 60-62; D.E. 20). Used to record an alphanumeric code to reference-designate the system being reported on. The input for these data-element positions will be derived through reference to the previously transcribed "Work Unit Code" (data element 12) and the previously recorded "Bu/ser Number" (data element 7) and a matrix relating these numbers to the reference designator code required in these positions. The required matrix will be supplied, and updated, by project personnel when implementation of this feature of the program is desired. If the matrix is not provided, or if a cross reference is not given in the matrix supplied, leave these positions blank.

9. (Reference: R.P. 63-67, 83-97; D.E. 21 and 24). Transcribe from a level-1 CT 11 or CT 16 having a JCN which matches the record JCN. In either case, the card must contain "Action Taken" code "T". (This data element should exist on a CT 11 only when the CT 11 has an "Action Taken" code "T" in its column 42. Otherwise, this CT-11 column should be blank). If this data element cannot be filled in from a CT in the current batch, its position will be left blank.

10. (Reference: R.P. 68-72, 98-112; D.E. 22 and 25). Transcribe from any CT 16, 26, or 31 record present which has a JCN matching that transcribed into ARINC Research Record positions 1-11 (see data elements 1-4). A selected CT 16 must not have "Action Taken" code "T" in the card column 25 (this code is not used on CT 26 and CT 34, and these need not be checked).

If the CT selected for this use (in accordance with the priority system established by Note 1) is a CT 16 or 26, verify that the CT being used has the same "Type Equipment," "BUNO", "Action Organization," "Action Date," "Work Unit Code," "Action Taken," and "Malfunction Code" (see data elements 6, 7, 8, 10, 12, 15 and 16, respectively) as previously recorded for those data elements.

If the CT selected for this use is a CT 31, verify that it contains the same data for "Type Equipment," "BUNO", "Work Unit Code," "When Discovered," and "Type Maintenance Code" (see data elements 6, 7, 12, 13, and 14, respectively) as previously recorded for those data elements. Also, the CT 31 must not have a suffixed JCN.

If the selected CT for this use is the same one used initially to derive the JCN transcribed (see priorities established by Note 1), disregard these verifications, except to ensure that the selected CT 31 does not have a suffixed JCN, and proceed with the transcription of these elements.

10A. (Reference: R.P. 73-82, 113-117; D.E. 23 and 26). Same note as 10, except delete reference to 31 cards and substitute 34 cards. Delete the entire third paragraph. Delete the last sentence of the first paragraph to remove all restrictions on action-taken code.

11. (Reference: R.P. 141-145, 161-175; D.E. 30 and 33). Same note as 12, except delete reference to CT 27 and delete the phrase "but if the selected CT is a 17 it does not contain a 'U' in card column 25." Also, add: "Use the selected CT 17 only if it contains an Action Taken Code 'U' in its card column 25."

12. (Reference: R.P. 146-160, 176-195; D.E. 31, 32, 34, and 35). Transcribe from any CT 17 or 27 present which has a JCN matching that recorded in record positions 1-11; but if the selected CT is a 17, it does not contain a "U" in card column 25.

12A. (Reference: R.P. 151-160, 191-195; D.E. 32 and 35). Use any CT 17 or 27 having the record's JCN. Before transcribing, verify that the CT 17 or CT 27 being used has the same "Type Equipment", "BUNO", "Action Organization", "Action Date", "Work Unit Code", and "Malfunction Code" (see data elements 6, 7, 8, 10, 12, and 16 respectively) as previously transcribed for these elements. If the CT 17 or 27 selected for this use is the same one used to determine

the JCN (in accordance with the priority system of Note 1), disregard this verification and proceed with the transcription of this element.

13. (Reference: R.P. 122-128, D.E. 28). These seven positions will be used to enter the LRU type number of the removed item. This will be an alpha/numeric code derived from a part-number vs. type-number matrix as supplied by project personnel. When the part number (see data element 24 or 25) does not appear in the matrix, leave the positions blank. The matrix will be updated from time to time.

13A. (Reference: R.P. 200-206; D.E. 37). Same note as 13, except read in the parentheses "(see data elements 33 or 34)". The same matrix will be used for deriving inputs for data elements noted by 13 and 13A.

14. (Ref: R.P. 118-121; D.E. 27). Used to record, by numeric code, the system-configuration baseline number. This baseline number will indicate the latest system baseline to which the removed item is applicable. The number will be determined by reference to baseline-number vs. part-number matrix as supplied by project personnel. When the part number (see data element 24 or 25) does not appear in the matrix, leave these positions blank. The matrix will be updated from time to time.

14A. (Ref: R.P. 196-199; P.E. 36). Same note as 14 above, except read ("See data element 33 or 34)" in the parentheses. The same matrix will be used in deriving inputs for data elements noted by 14 and 14A.

15. (Ref: R.P. 129-140; D.E. 29). Used for reference designation, by alpha-numeric code, of the configuration of the system reported on, and of the removed item. The first four digits will indicate system configuration, and the last eight digits will indicate the removed-item reference designator.

The system-configuration code will be derived from a matrix showing configuration vs BUNO, or no system serial number if the system is not installed on an aircraft.

The removed-item reference designator will be derived by referring to a matrix showing part number (data element 24 or 25) vs. reference designator.

If the part number or BUNO does not appear on the matrix, leave these positions blank. The matrix will be updated from time to time.

15A. (Ref: R.P. 207-218; D.E. 38). Same note as 15, except delete the second paragraph. In the existing third paragraph read "(in the parentheses see data element 33 or 34)". The same part-number matrix will be used to derive inputs for data elements noted by 15 or 15A.

15B. (Ref: R.P. 705-716; D.E. 143). Same note as 15 except delete the second paragraph. In the existing third paragraph read "in the parentheses see data element 141)". The same part-number matrix will be used as in Note 15.

16. (Ref: R.P. 219-244, 249-274, 279-304, 309-334, 339-364, 369-394; D.E. 39-43, 45-49, 51-55, 57-61, 63-67, 69-73). Transcribe from any CT-12 present, which is coded "Maintenance Level -1" in its column 28 and has a non-suffixed JCN matching that previously entered in the record (see data elements 1-4). Before transcribing, verify that the CT 12 to be used has the same "Type Equipment", "BUNO", "Action Organization", "Work Center", "Action Date", "Work Unit Code", "When Discovered Code", and "Type Maintenance Code" (see data elements 6, 7, 8, 9, 10, 12, 13, and 14) as previously transcribed for these elements. Disregard this verification and proceed with the transcription if the CT selected is the same one used to initially transcribe the JCN (in accordance with No. 1 priorities).

Note that in any batch of new data to be transcribed there may be an unlimited number of CT 12 or CT-32 documents relating to a given JCN. These should (within cards of like CT number) all contain identical information in all card columns, except those card columns 42 through 74 which are the data describing an item of failed material, used by Level-1 Maintenance or Level-2 maintenance. Of course, some individual items (e.g., quantities of items, action taken, etc.) within these card columns may, by chance, be identical, but over the entire field, from one CT 12 or CT-32 to another, they should be different. It makes no difference which of the reported failed material items is assigned to which line-item designation in the ARINC Research file provided the maintenance-level differentiation is kept. (See elements 39 through 44, 45 through 50, 51 through 56, 57 through 62, 63 through 68, and 69 through 74 in the ARINC Research Record for the case of CT-12s coded maintenance level 1; see data elements 92-97, 98-103, 104-109, 110-115, 116-121 and 122-127 for the case of CT-12s coded maintenance level-2 and CT-32s). If more than six cards pertaining to the same JCN and maintenance level are present in a batch of data being transcribed, six should be assigned line-item numbers within each level of maintenance, randomly, and transcribed into the record in the order selected. Remaining cards within each maintenance level should be coded by deleting "Away Code" from the card and substituting a code in the CT column. (Code assignments are given in the General Processing Remarks). They should be stored on the current residue file tape and be available for processing as part of the MDCS record when displays are being generated from the file data. Check to guard against duplicate entries in the event duplicate cards appear during transcription. No account will be taken of duplicates.

16A. (Reference: R.P. 459-461, 464-483, 489-491, 494-513, 519-521, 524-543, 549-551, 554-573, 579-581, 584-603, 609-611, 614-633, 93, 95-96, 99, 101-102, 105, 107-108, 111, 113-114, 117, 119-120, 123, 125-126). Transcribe as in note 16, except delete the first sentence and substitute a sentence to read as follows:

Transcribe from any CT-12 present which is coded Maintenance Level 2 in CT column 28 and has a non-suffixed JCN matching the record JCN; also, transcribe from any CT-32s present having a non-suffixed JCN matching the record JCN.

In addition, to the above substitution, delete the numbers in the second set of parentheses of the first paragraph and substitute the following: (6, 7, 75, 12, 13, 14). Also in the second sentence of the first paragraph of note 16 delete "Work Center".

16B. (Reference: R.P. 757-782, 789-814, 821-846, 853-878, 885-910, 917-942; D. E. 154-158, 160-164, 166-170, 172-176, 178-182, 184-188). Same as Note 16, except delete reference to Maintenance Level 1, and substitute maintenance level 2; also delete reference to non-suffixed JCNs and substitute CT 12 and 32 having a suffixed JCN. Also delete the numbers in the second set of parentheses following "Type Maintenance Code" and substitute: (7, 128, 131, 132, and 133 if the selected CT is a 12 card and, in addition, 129 if the CT is a 32 card).

Following the semi-colon used in the last set of parentheses appearing in Note 16, change the remainder of that sentence to read: "see elements 155, 157-158, 161, 163-164, 167, 169-170, 173, 175-176, 179, 181-182, 185, and 187-188 in the ARINC Research record for the case of level-2 CT 12s and CT 32s."

16C. (Reference: R.P. 458, 462-463, 488, 492-493, 518, 522-523, 548, 552-553, 578, 582-583, 608 and 612-613; D.E. 92, 94, 98, 100, 104, 106, 110, 112, 116, 118, 122 and 124). Same as note 16A, except that transcription of data from CT 12s is not permitted.

16D. (Reference: R.P. 757, 761-762, 789, 793-794, 821, 825-826, 853, 857-858, 885, 889-890, 917 and 921-922; D.E. 154, 156, 160, 162, 166, 168, 172, 174, 178, 180, 184, and 186). Same as note 16B, except that transcription from CT 12s is not permitted.

17. (Ref: R.P. 245-248, 275-278, 305-308, 335-338, 365-368, 395-398; D.E. 44, 50, 56, 62, 68, and 74). Used to record reference numbers of project notes on failed material. Entries will be derived from a matrix of part numbers (see data element 43, 49, 55, 61, 67, or 73, as appropriate) vs. note-reference numbers to be supplied by project personnel. If a part number does not appear on the matrix, leave these positions blank. The matrix will be updated from time to time.

17A. (Ref: R.P. 484-487, 514-517, 544-547, 574, 577, 604-607, and 634-637; D.E. 97, 103, 109, 115, 121, and 127). Same note as 17, above, except read inside the parentheses (see data element 96, 102, 108, 114, 120, or 126, as appropriate).

17B. (Ref: R.P. 783-788, 815-820, 847-852, 879-884, 911-916, and 943-948; D.E. 159, 165, 171, 177, 183, and 189). Same note as 17, above, except read inside the parentheses (see data element 158, 164, 170, 176, 182, or 188, as appropriate).

18. (Ref: R.P. 399-401; D.E. 75). Transcribe from any maintenance level-2 CT 11, 12, 31, 32 or maintenance level-2 41, 46, or 47 present which has a non-suffixed JCN matching the JCN previously transcribed as data elements 1-4. Also, verify that a CT 11, 12, 31, or 32 used has the same "Type Equipment," "BUNO," "Work Unit Code," "When Discovered Code," and "Type Maintenance Code" as previously transcribed as data elements 6, 7, 12, 13, and 14.

(Note: In cases where CT 21's and 31's are missing from the new data batch, the CT record used here may be the same one from which the ARINC Research data elements 1-4 were originally transcribed -- in accordance with the priority system established in Note 1. In this case, disregard the latter verifications and proceed to transcribe this element.)

If the selected CT is one of the 40-series, verify as above except only for "Type Equipment" and "BUNO" since the other items are not included on this series.

If the selected CT meets the above criteria, proceed with the transcription of this data element.

18A. (Ref: R.P. 405-408; D.E. 77). Same as note 18, except delete reference to CT's 11 and 12 and change the last paragraph of note 18 to **add:** ...except when a selected CT 31 is coded action taken "D".

18B. (Ref: R.P. 415-421; D.E. 81 and 82). Same note as 18A, except delete reference to CT's 32, 46, and 47.

18C. (Ref: R.P. 410-412; D.E. 79). Same as note 18, except delete reference to CT's 12, 32, 41, 46, and 47 and add that CT 11's selected must not contain action-taken code "D, L, M, N, or Y". Also, if a selected CT 31 has an action taken code "D", do not transcribe from it.

18C. (Ref: R.P. 410-412; D.E. 79). Same as note 18, except delete reference to CT's 12, 41, 46, and 47 and add that CT 11's selected must not contain action-taken code "Y".

18D. (Ref: R.P. 413-414; D.E. 80). Same as note 18, except delete reference to CT's 11, 12, 32, 46, and 47.

18E. (Ref: R.P. 409; D.E. 78). Same as note 18A, except delete reference to CT 32, 41, 46, and 47 and delete reference to CT 31 coded action taken "D".

18F. (Ref: R.P. 402-404; D.E. 76). Same as note 18, except delete reference to CT's 11 and 12.

19. (Ref: R.P. 422-453; D.E. 83-90). Transcribe from any CT 34 present which has a JCN matching the one previously entered as data elements 1-4. The CT 34 used must not have a suffixed JCN.

Verify that the data in card columns 12-21 ("Serial Number") and the data in card columns 22-26 (Time/Cycle) match those previously recorded in the ARINC Research Record as data elements 23 and 26, respectively. If this is not true, indicate a discrepancy on the error print-out.

In addition, if there are data entered in columns 59-66 of the selected CT 34, the CT 34 document should be printed out on the 3M Transcription error print-out after transcribing the above data elements. In cases where some CT's are missing from the new data batch, this could be the same CT 34 used to initially transcribe the JCN for the record (see notes 1 and 2); in this event, disregard the above verification procedure and proceed with transcription of this data element.

20. (Ref: R.P. 454-457; D.E. 91). Used to record reference numbers of project notes on repair-cycle data. Entries will be derived from a matrix of part numbers (see data elements 24 or 25) vs. project note number. If a given part number does not appear on the matrix, leave these positions blank. The matrix will be updated from time to time.

21. (This note number intentionally unused.)

22. (Ref: R.P. 638-640, 648-656; D.E. 128-129, 131-133). Transcribe only from level-2 CT 11's, 12's, 31's, or 32's admitted through the action-taken-code criteria of note 1 having suffixed JCN's matching the JCN transcribed as ARINC Research data elements 1-4.

Note that the selected CT may be the same one which was used to derive the data elements 1-4 initially (see Note 1). If this is the case, as indicated by the Original Document Designator. Element 5 (see Note 2), proceed with the transcription from a CT 31 or 32 selected without further checking or verification. However, if the ARINC Research Record JCN was entered from the alternative (CT 11 or 12) verify that columns 12 through 21 are identical to the previously transcribed data elements 6 and 7 of the ARINC Research Record before proceeding to transcribe the data.

- 22A. (Ref: R.P. 663-669; D.E. 137-138). Same as note 22, except delete reference to CT's 11, 12, and 32. Also, add: If the selected CT is a CT 31, its action-taken code must be other than "D".
- 22B. (Ref: R.P. 644-647; D.E. 130). Same as note 22, except delete reference to CT's 11 and 12. Also, add: If the selected CT is a CT 31 its action taken code must be other than "D".
- 22C. (Ref: R.P. 657, 661-662, 670-689; D.E. 134, 136, 139-140). Same note as 22A, except delete the additional sentence.
- 22D. (Ref: R.P. 658-660; D.E. 135). Same as note 22, except delete reference to CT's 12 and 32. Also, add: If the selected CT is a 31, its action-taken code must be other than "D". Then, add: If the selected CT is an 11 card, its action-taken code must be other than "D, L, M, N or Y".
- 22E. (Ref: 641-643; D.E. 129). Same as note 22, except delete reference to CT's 11 and 12.
23. (Ref: R.P. 690-704, 717-756; D.E. 141-142, 144-153). Transcribe from any CT 34 present which has a suffixed JCN matching the suffixed JCN previously recorded as ARINC Research data elements 1-4. Note that this could be the same CT record used to derive data elements 1-4 initially, as indicated by the original Document Designator (see Notes 1 and 2). If there are data in CT columns 59-66, print out this record on the error-file display.
24. This note number intentionally unused.
25. This note number intentionally unused.
26. (Ref: R.P. 949-952; D.E. 190). Transcribe from a selected CT 11 present having a JCN matching the JCN previously recorded in record positions 1-11 (in accordance with the priority established under Note 1), provided the CT 11 has a "one" in its "Maintenance Level" column, 28, and an "N" in its "Action Taken" column, 42.

If more than one Action Taken "N" Maintenance Level "one" CT 11 is present, select the one with the earliest "Action Date" in its columns 29-32, provided that the data in card columns 12 through 27 are the same as previously recorded under data elements 6 through 9 and that the data in columns 33 through 41 are the same as previously recorded data elements 12 through 14.

26A. (Ref: R.P. 960-963; D.E. 193). Transcribe as in note 26, except select a CT 11, if any are present, having an "Action Date" next subsequent to that recorded as data element 190.

26B. (Ref: R.P. 953-959; D.E. 191-192). Transcribe from the same card-type document as selected under data element 190 (see note 26).

26C. (Ref: R.P. 964-970; D.E. 194-195). Transcribe from the same card-type document as selected under data element 193 (see note 26A).

27. (Ref: R.P. 971; D.E. 196). Transcribe from a selected CT 11 present having a JCN matching the JCN previously recorded in record positions 1-11 (in accordance with the priority established under note 1) provided the CT 11 has a "one" in its column 28 and an "L" or "M" or "D" in its "Action Taken" column (42) and there are no maintenance-level "one" CT 11's present with the same action-taken code and an earlier "Action Date" in columns 29-32. However, verify that the data in card columns 12 through 27 are the same as previously recorded under data elements 6 through 9 and that the data in columns 33 through 41 are the same as previously recorded under data elements 12 through 14.

27A. (Ref: R.P. 983; D.E. 200). Transcribe as in Note 27, except use a CT 11, if any are present, having an "Action Date" next subsequent to that recorded as data element 197.

- 27B. (Ref: R.P. 995; D.E. 204). Same note as 27A, except read: "... data element 201".
- 27C. (Ref: R.P. 1007; D.E. 208). Same note as 27A, except read: "... data element 205".
- 27D. (Ref: R.P. 1019; D.E. 212). Same note as 27A, except read: "... data element 209".
- 27E. (Ref: R.P. 1031; D.E. 216). Same note as 27A, except read: "... data element 213".
- 27F. (Ref: R.P. 972-982; D.E. 197-199). Transcribe from the same CT document as was used to transcribe data element 196 (see note 27).
- 27G. (Ref: R.P. 984-994; D.E. 201-203). Transcribe from the same CT document as was used to transcribe data element 200 (see note 27A).
- 27H. (Ref: R.P. 996-1006; D.E. 205-207). Transcribe from the same CT document as was used to transcribe data element 204 (see note 27B).
- 27I. (Ref: R.P. 1008-1018; D.E. 209-211). Transcribe from the same CT document as was used to transcribe data element 208 (see note 27C).
- 27J. (Ref: R.P. 1020-1030; D.E. 213-215). Transcribe from the same CT document as was used to transcribe data element 212 (see note 27D).
- 27K. (Ref: R.P. 1032-1042; D.E. 217-219). Transcribe from the same CT document as was used to transcribe data element 216 (see note 27E).

28. This note number intentionally unused.

29. (Ref: R.P. 1043-1046; D.E. 220). Transcribe from any CT 11 present having a non-suffixed JCN matching the JCN previously recorded in record positions 1-11 (in accordance with the priorities established in note 1), provided the CT 11 has a "two" in its "Maintenance Level" column (28) and an "N" in its "Action Taken" column (42) and there are no other action-taken "N", Maintenance Level "two", CT 11's present with an earlier "Action Date" in their columns 29-32. However, before transcribing, verify that the data in card columns 12 through 21 are the same as previously recorded under data elements 6 and 7, that the data in columns 22 through 27 are the same as previously recorded for data elements 75 and 76, and that the data in card columns 33 through 41 are the same as previously recorded for data elements 12, 13, and 14 in the ARINC Research Record.

29A. (Ref: R.P. 1054-1057; D.E. 223). Transcribe as in note 29, except use a CT 11, if any are present, having an "Action Date" next subsequent to that recorded as data element 220.

29B. (Ref: R.P. 1047-1053; D.E. 221-222). Transcribe from the same card-type record as selected under data element 220.

29C. (Ref: R.P. 1058-1064; D.E. 224-225). Transcribe from the same card-type record as selected under data element 223.

30. (Ref: R.P. 1065; D.E. 226). Transcribe from a selected CT 11 present having a non-suffixed JCN matching the JCN previously recorded in record positions 1-11 (in accordance with the priorities established under note 1). Check that the CT 11 has a "two" in its column 28 and an "L," "M," or "D" in its "Action Taken" column (42), or the data may come from a level-12, CT 31 having a "D" in its action taken column. Also, check that if there are other (L,M, or D

coded), Maintenance Level "two", CT 11's of the record's JCN with the same action taken code present, then the one selected has the earlier "Action Date" (columns 29-32). If the selected card is a CT 11, and there is a date previously recorded in record positions 1066-1069 (from a CT 12 which may have preceded the CT 11 in a previous batch), check that its action date is the same and that the CT 11's action-taken code is "L". However, before transcribing, verify that the data in card columns 12 through 21 are the same as previously recorded under data elements 6 and 7; that the data in columns 22 through 27 are the same as previously recorded for data elements 75 and 76; and that the data in card columns 33 through 41 are the same as previously recorded for data elements 12, 13, and 14.

30A. (Ref: R.P. 1077; D. E. 230). Transcribe as in Note 30, except use a CT 11 or 31, if any are present, having an "Action Date" next subsequent to that transcribed as data element 226.

30B. (Ref: R.P. 1089; D.E. 234). Same note as 30A, except read: "... data element 230".

30C. (Ref: R.P. 1101; D.E. 238). Same note as 30A, except read: "... data element 234".

30D. (Ref: R.P. 1070-1076; D.E. 228-229). Transcribe from the same card as selected under data element 226.

30E. (Ref: R.P. 1082-1088; D.E. 232-233). Transcribe from the same card as selected under data element 230.

30F. (Ref: R.P. 1094-1100; D.E. 236-237). Transcribe from the same card as selected under data element 234.

30G. (Ref: R.P. 1106-1112; D.E. 240-241). Transcribe from the same card as selected under data element 238.

31. (Ref: R.P. 1066-1069; D.E. 227). Transcribe from a selected CT 11, 12, or 31 present having a non-suffixed JCN matching the JCN previously transcribed. Check that the selected CT is coded for maintenance level "two". If the selected CT is a CT 11 or 31 coded action-taken "D", it must be the same document as selected for transcription of data element 226 in accordance with note 30. If the selected card is a CT 11, and this position has previously been filled (by data from a CT 12), check that its action date is the same as previously recorded in these positions and that its action-taken code is "L" and, if so, proceed to use the CT 11 as in notes 30 and 30D.

If the selected document is a CT 12 and there are other CT 12's of the record's JCN present having different action dates, check that the CT 12 selected is one with the earliest action date among those dates represented. (There may be multiplicities of CT 12's with the same action date present in the batch as described previously under note 16.)

Having selected a CT 12 according to the above procedure, continue by performing the verification checks called for under the last sentence of note 30. If the data on the selected CT 12 meets these criteria, proceed to transcribe this data element.

31A. (Ref: R.P. 1078-1081; D.E. 231). Transcribe as in note 31, except use a CT 11 or 12, if any are present, having an "Action Date" next subsequent to that transcribed as data element 227.

31B. (Ref: R.P. 1090-1093; D.E. 235). Same note as 31A, except read: "...as data element 231".

31C. (Ref: R.P. 1102-1105; D.E. 239). Same note as 31A, except read: "...as data element 235".

32. (Ref: R.P. 1113-1115; D.E. 242). Transcribe from any CT 11 having a Maintenance-level code 1 and JCN matching the previously recorded JCN and an "Action Taken" code "Y" (see card column 42) provided its "Type Equipment," "BUNO," "Action Organization," "Work Center," "Work Unit Code," "When Discovered Code," and "Type Maintenance" information matches with previously transcribed data elements numbered 6, 7, 8, 9, 12, 13, and 14, respectively.

32A. (Ref: R.P. 1116-1126; D. E. 243-245). Transcribe from the same card as used under note 32.

32B. (Ref: R.P. 1127-1129; D.E. 246). Same note as 32, except the CT must be coded Maintenance Level 2. Also, delete reference to data elements "8" and "9" and substitute: "75 and 76 if the JCN is non-suffixed, but substitute 128 and 129 if the JCN is suffixed". Also, delete reference to "Maintenance Level" "one" (column 28) and substitute "Maintenance Level" "two" and delete the words "non-suffixed".

32C. (Ref: R.P. 1130-1140; D.E. 247-249). Transcribe from the same CT selected under note 32B.

33. (Ref: R.P. 1141-1143; D.E. 250). Transcribe from a selected CT 11 having a JCN matching the ARINC Research Record JCN, provided:

- (1) It does not contain "Action Taken" codes D, L, M, N, or Y.

- (2) Its "Items Processed" (columns 46-47) must contain "zero zero".
- (3) If its "Maintenance Level" code (column 28) is a "one," its "Type Equipment," "BUNO," "Work Unit," "When Discovered," "Type Maintenance," and "Malfunction" codes must match with previously transcribed data elements numbered 6, 7, 12, 13, 14, and 16, respectively.
- (4) If the code in column 28 is a "two" and the JCN is non-suffixed, the above-listed codes must match with previously transcribed data elements 6, 7, 12, 13, 14, and 79, respectively.
- (5) When the selected CT has a suffixed JCN and the code in column 28 is a "two," the above-listed codes must match with previously transcribed data elements 6, 7, 131, 132, 133, and 135, respectively.
- (6) Its "Work Center" code (columns 25-27) must be different from that previously transcribed from other card records under data element 9 when its "Maintenance Level" code is "one"; or different from data element 76 if level-two with non-suffixed JCN, or different from data element 129 if the JCN is suffixed.
- (7) If several cards which meet the above selection criteria are present in a given batch of data, the one to be used for transcribing this data element is the one having the earliest "Action Date" in card columns 29-32. If all present CT's which qualify have the same action-taken date, select among them at random.

- (8) If the selected CT is a CT-11 having an alphabetic character in card column 8 of the JCN serial numbers columns (8-10) of the CT, it must have at least one non-zero digit in its "Man-Hours" columns in order to qualify as a CT from which this data element may be transcribed. (Note that blanks in the "Man-Hours" columns are disallowed by the keypunch instructions for 3M CT's.)

33A. (Ref: R.P. 1160-1162; D.E. 257). Select a CT 11 using the same criteria as in note 33, except use a card having an action date next subsequent to the one used for data element 250. If several are present which have the same action date, select one at random from those remaining after selecting the card for use on data element 250. If any additional CT 11's meeting the Note 33 criteria and this note's criteria are present, print these out, coded in accordance with the General Processing Remarks, on the residue print-out and retain them on the residue file tape.

33B. (Ref: R.P. 1144-1159; D.E. 251-256). Transcribe from the same CT 11 used for data element 250.

33C. (Ref: R.P. 1163-1178; D.E. 258-263). Transcribe from the same CT 11 used for data element 257.

34. (Ref: R.P. 1179-1182; D.E. 264). Transcribe from a selected CT 11 having a JCN matching the ARINC Research Record JCN provided:

- (1) It contains "action taken" code "N".
- (2) Its "Action Organization" and "Work Center" codes are the same as previously transcribed into the record from other cards under data elements numbered 250 and 251, respectively.

- (3) Its "Maintenance Level" code is the same as that previously transcribed into the record as data element 252.
- (4) Its "Items Processed" columns contain "zero-zero".
- (5) Its "Type Equipment," "BUNO," "Work Unit," "When Discovered," "Type Maintenance," and "Malfunction" codes, if it is a level-1 CT as determined by (3) above, must match with data elements numbered 6, 7, 12, 13, 14, and 16, respectively; or if it is a level-2 CT as determined by (3) above, the above codes must match with those in data elements numbered 6, 7, 12, 13, 14, and 79 (or if the JCN is suffixed, use 6, 7, 131, 132, 133, and 135) as previously transcribed from other cards.
- (6) Where there is more than one CT 11 meeting the above criteria, it is the one with the earliest "Action Date".

If several CT 11's meeting the criteria and having identical action dates are present, select at random from these to transcribe this data element.

34A. (Ref: R.P. 1190-1193; D.E. 267). Transcribe from a CT 11 selected as in note 34, except use a CT 11 having an "Action Date" next subsequent to the date transcribed previously as data element 264. Also, check its "Action Organization", "Work Center" and "Maintenance Level" codes against those previously transcribed as data elements 257, 258, and 259, respectively, instead of data elements 250, 251, and 252 as in note 34.

34B. (Ref: R.P. 1183-1189; D.E. 265-266). Transcribe from the same CT 11 selected for use under data element 264 (see note 34).

34C. (Ref: R.P. 1194-1200; D.E. 268-269). Transcribe from the same CT 11 selected for use under data element 267 (see note 34A).

35. (Ref: R.P. 1201; D.E. 270). Same as note 34, except under "(1)" delete "N" and substitute "D," "L," or "M".

35A. (Ref: R.P. 1213; D.E. 274). Same as note 34A, except add: Use a CT 11 having an "Action Date" next subsequent to the date transcribed previously as data element 271.

35B. (Ref: R.P. 1202-1212; D.E. 271-273). Transcribe from the same CT 11 as selected for data element numbered 270 (see note 35).

35C. (Ref: R.P. 1214-1224; D.E. 275-277). Transcribe from the same CT as selected for data element numbered 274 (see note 35A).

36. (Ref: R.P. 1225-1228; D.E. 278). Transcribe from a selected CT 11 having a suffixed JCN matching a suffixed JCN previously entered in the record, provided:

- (1) It contains "Maintenance Level" code "two".
- (2) Its "action taken" code is "N".
- (3) Its "Action Organization" and "Work Center" codes are the same as those previously transcribed into the record from other cards under data elements numbered 128 and 129.
- (4) It has the same "Type Equipment," and "BUNO" codes as previously transcribed into the record from other cards under data elements 6 and 7.

(5) It has the same "Work Unit," "When Discovered," "Type Maintenance", and "Malfunction" codes as previously transcribed from other cards under data elements numbered 131, 132, 133, and 135.

(6) Its "Items Processed" code is "zero".

36A. (Ref: R.P. 1229-1235; D.E. 279-280). Transcribe from the same CT 11 as selected under data element numbered 278.

37. (Ref: R.P. 1236; D.E. 281). Same note as 36, except under "(2)" delete "N" and substitute "L," "M," or "D," and delete the criterion numbered "(6)". Also, change the wording to specify use of suffixed JCN CT 31s coded "Action Taken-D".

37A. (Ref: R.P. 1237-1240; D.E. 282). Same as note 36, except make changes/deletions as follows:

- (1) Under "(2)" in note 36 delete "N" and substitute "L," "M," or "D" and delete criterion "(6)".
- (2) Change the phrase in 36 which reads "...selected CT 11 having..." to read: "...selected CT 11, 12 or 31 with Action Taken Code "D". having ..."
- (3) In "(5)" of note 36 delete reference to "Malfunction" code and delete reference to data element "135" as pertaining to selected CT 12's only. (CT 12's do not contain the "Malfunction Code" data element.)

Also, after changing note 36, as above, add the following statement: If the CT selected is a CT 11 document, it must be the same document from which data element 281 was transcribed. If a date has previously been entered in these positions (as from a preceding CT 12), make the checks on subsequent CT11s for action taken "L" as in note 31.

37B. (Ref: R.P. 1241-1247; D.E. 283-248). Transcribe from the same CT 11 or 31 as selected under data element numbered 281 (see note 37).

38. (Ref: R.P. 1326-1327; D.E. 302). After the transcription of each JCN record as detailed above, if there are 3M cards remaining in the processed data batch which are not transcribable, due to insufficient space allocation or lack of sufficient identification with data in the file, a symbol will be entered in this record position and these card records will be printed out and entered on a Residue Record tape file to be utilized through further programming when generating displays from the record. (See General Processing Remarks.)

39. (Ref: R.P. 1248-1251; D.E. 285-287). Transcribe only from CT's 41, 46, and 47 having JCNs matching that initially transcribed in the record.

39A. (Ref. R.P. 1265; D.E. 295). Same as note 39, except delete reference to CT 47.

39B. (Ref.: R.P. 1252-1264; D.E. 288,289, 290, 291, 292, 293, and 294). Same as note 39, except delete reference to CT 46 and 47.

40. (Ref: R.P. 1266-1295; D.E. 296-298). Transcribe only from CT 46's having JCN matching that initially transcribed in the record.

41. (Ref: R.P. 1296-1325; D.E. 299-301). Transcribe only from CT 47's having JCN matching that initially transcribed in the record.

3. List of 983 MDCS/ASD Data and RM Indices Displays

The ARINC Research system of algorithms provides the following computer generated displays:

3.1 Maintenance Data and RM Indices Displays

- (1) Maintenance Action, Removed Items, and Flight Time by Individual Systems
- (2) System Level Reliability Summary
- (3) LRU Reliability Display
- (4) LRU Maintenance Actions Summary Display
- (5) LRU Reliability by Functional Group
- (6) Replaced Failed Materials Display
- (7) Replaced Major Components and Sub-Assemblies Display
- (8) System Maintainability
- (9) LRU Maintainability

3.2 MDCS/ASD File Survey Displays

- (10) Master Input Tape Survey - Inventory of Type Equipments, Work Unit Codes, Organization, and 3M Card Types
- (11) 983-MDCS/ASD File Survey Display
- (12) Data Transcription Run Error Print-Outs
- (13) Residue File Print-Outs

4. Description of the 983-MDCS/ASD Displays

Examples of the displays, in the form of actual displays used for the analyses performed under contract N00019-71-C-0355, are included in Appendix C. These displays should be used as references while the following display descriptions are being read:

4.1 MDCS/ASD-983 Computer Display No. 1 -- Maintenance Actions, Removed Items, and Flight Time by Individual Systems

4.1.1 Purpose

This display is intended to provide a means for rapid retrieval of the day-by-day maintenance and flight history on specific systems of interest. Such interest may be engendered through inspection of the system-reliability display to select systems above or below sample norms in order to investigate more fully the reasons for deviation of their reliability indexes.

4.1.2 General Description

This display provides a listing, from the MDCS/ASD-983 file, of data on maintenance events (identified by JCN), flights, and flight hours for each selected system on a day-to-day basis (according to JCN date code).

The complete maintenance history, as represented by the filed data, for each JCN is listed. The data are segregated by printing, on different rows the data reported for level-1 and level-2 maintenance, on-equipment and off-equipment work, major component or sub-assembly repair.

The number of flights for the aircraft, the number of flights indicated by flight-purpose code as requiring use of the subject subsystem, the cumulative aircraft flight hours on the JCN date, and the cumulative aircraft flight hours since the first day of the specified data period, or date range of the data, are also given.

4.1.3 Detailed Contents

The attached Table 1 shows the names of the data elements displayed, the column heading abbreviations, print positions on the display rows, and MDCS-983 file-format record positions from which the displayed data are extracted. The flight and flight-hour data elements are extracted from the ASD file, CT-76, images, which are

retained with respect to these data elements in the same format as specified by the NAMP manual.

4.1.4 Information Required When Requesting Display Runs

The scope of this display is controlled through the specification, on a display request document, of the display control parameters described in Table 2. With the exception of the type-equipment codes and the JCN Date Range, the control parameters specified to requisition the display are not shown on the title block. Display-request documentation should be initiated and retained as a reference to the sampled systems and related information controlling the scope of the display*.

4.1.5 Computer-Programmed Logic for Selection of Data for Rows

Criteria for selecting the data to be displayed in each of the rows are given in Table 3. The rows have the following significance:

- Row-1: On-equipment maintenance-action data reported by level 1 maintenance crews wherein no removal and replacement of a repairable item took place. Thus, the row designation of "SYS-L1" for system maintenance action at maintenance level 1.
- Row-2: Maintenance data reported by level-1 maintenance crews where removal and replacement of a repairable item to be repaired off-equipment took place. Thus, the row designation "RPBL-L1 " for removal of a repairable item at maintenance level 1.
- Row-3: Maintenance data reported by level 2 maintenance crews in repairing a repairable item off-equipment. Thus, the row designation "RPBL-L2" for action on a removed repairable item at maintenance level 2.

*The Display Control Parameters can be made available in computer print-out form by printing the output of the part of the computer-programmed algorithm which selects the filed data for processing to generate the display.

TABLE 1

DISPLAY 1

MDCS/ASD-983 Computer Display No. 1
Data Element, Print Position, and File Position Identification

Col. No.	Data Element	Column Heading	Print Position	MDCS-983 Record Positions			
				Row 1	Row 2	Row 3	Row 4
1	Action Level	ACT-LVL	1-7	SYS L1	RPBL L1	RPBL L2	SUBA L2
2	Job Control Number	JCN	9-19	1-11	1-11	1-11	1-11
3	Number of Aircraft Flights (on JCN date)	FLTS	21-24	(Derived from ASD file)			
4	Bureau or Serial No.	BU/SER	26-31	18-23	13-23	18-23	18-23
5	Action Organization	ORG	33-35	24-26	24-26	399-401	638-640
6	Work Center	WC	37-39	27-29	27-29	402-404	641-643
7	Action Date	DATE	41-44	30-33*	30-33	405-408	644-647
8	Inspection Completion Date	IDAT	46-49	34-37	34-37	NA	NA
9	Work Unit Code	WUC	51-57	38-44	38-44	38-44	648-654
10	When Discovered Code	D	59	45	45	45	655
11	Type Maintenance	M	61	46	46	46	656
12	Action Taken	A	63	47**	47	409	657
13	Malfunction Code	MAL	65-67	48-50	48-50	410-412	658-660
14	Items Processed	IP	69-71	51-52	51-52	413-414	661-662
15	Ref. Designator	REF	73-75	60-62	60-62	NA	NA
16	Removed Item Part No.	RI PART	77-91	83-97	98-112	469-483	768-782
17	Number of System Flights (on JCN date)	SF	91-94	(Derived from ASD file on a basis of flight-purpose codes)			
18	Removed Item Configuration/Quantity	CONF/QUAN	96-99	118-121	118-121	458-637	757-948
19	Removed Item Type	RI TYPE	105-111	122-128	122-128	NA	NA
20	System Configuration/ Removed Item Ref. Des.	SCON/RI REF	113-124	129-140	129-140	NA	705-716
21	Cumulative Flight Time	CFH	126-128	(Derived from ASD file)			
22	Aircraft Flight Time (on JCN date)	FHD	130-132	(Derived from ASD file)			

*Read from R.P. 1116-1119 if row selection criteria 9 only occurs.

**Insert "Y" if row selection criteria 9 only occurs.

TABLE 2

DISPLAY 1

983-MDCS/ASD Computer Display No. 1

Display Control Parameters (File Data
Selection Criteria)

Reference	Parameter (Data Element DE; in File Format)	Location, Record Position (RP) In MDCS-983 File Format	Notes
1	JCN Date Range (2)	4-7	One date range only: Julian dates, from-to inclusive
2	Type Equipment Codes (6)	14-17	Up to a maximum of 50 codes
3	Specific Systems Designator		Specify according to the following alternatives:
	(a) Action Organization (1)	1-3	Up to a maximum of 50 codes
	(b) List of Bu/Ser Numbers (7)	18-23	Up to a maximum of 1000 numbers
	(c) Configuration Number (29)	129-132	4-character configuration numbers only, up to a maximum of 25 numbers
	(d) Work-Unit Codes (12)m	38-44	Up to 1,000 4-character work unit codes
	(d) Combination of (a) and (c)		See (a) and (c) above
	(e) System Designator Unspecified		Display includes all systems in file within scope established by the other control parameters
4	Type Maintenance (14 or 133)	46	Up to a maximum of 50 codes
5	Action Taken (15 or 134)	47	Up to a maximum of 50 codes

(continued)

TABLE 2 (continued)

Reference	Parameter (Data Element DE; in File Format)	Location, Record Position (RP) In MDCS-983 File Format	Notes
	JCN Date Range (2)		
6	When Discovered Code (13)	45	Up to a maximum of 50 codes
7	Default Option Indicator	--	Specify Indicator Y if it is desired to include on the display records having any of the specified control parameter positions blank; otherwise, the display will not include re- cords having blanks in specified con- trol parameter positions

TABLE 3
DISPLAY-1

Display No. 1 Selection Criteria for display of data by row.

ROW 1

1. 63-67 \neq b + T/47
2. 83-97 \neq b + T/47
3. 141-145 \neq b + U/47
4. 161-175 = b + U/47
5. 63-67 = b + R, T, U/47
6. 83-97 = b + R, T, U/47
7. 141-145 = b + R, T, U/47
8. 161-175 = b + R, T, U/47
9. 1116-1119 \neq b: Process this case by inserting "Y" in display position 63; pick up MAL code from R.P. 1113-1115 and print in positions 65-67. Get action date from RP 1116-1119 and print in position 41-44. Pick up file positions 1113-1126 overflow from Residue file (residue code 4 if any).

NOTE: When Row 1 criterion 9 occurs in combination with any of the criteria, 1-8, a multiple row-1 print out is required.

ROW 2

68-72 = b + R/47
98-112 = b + R/47

ROW 3

1. 399-401 \neq b; 405-408 \neq b; Removed item Part No. read 469-483 (failed material and each repetition in six groups of failed material data.

(continued)

TABLE 3 (continued)

(Row 3 (continued))

2. Retrieve residue file data 469-483 overflow (residue code F) if any.
3. 399-401 \neq b; 1130-1133 \neq b (Insert "Y" in display position 63) pick up action date, display positions 41-44 from R.P. 1130-1133; MAL code, display positions 65-67, from 1127-1129.
4. Retrieve residue file data 1130-1133 overflow (residue code 5) if any.
5. 399-401 \neq b; 405-408 \neq b; 409-D pick up first date with "D" associated with it from R.P. 1066-1069 (1065=D), 1078-1081 (1077=D), 1090-1093 (1089=D), 1102-1105 (1101=D).
6. Pick up "D" action dates from residue overflow (Code L) if any.

ROW 4

1. Suffixed JCN with base digits equal to Row 1-3 JCN if present.
2. 638-640 \neq b; 644-647 \neq b; read removed item PN (display position 77-91) from 768-782 (failed material) and each repetition in six groups of failed material data.
3. Retrieve failed material residue overflow (residue code G).
4. 638-640 \neq b; 1130-1133 \neq b; insert "Y" (display positions 41-44) from R.P. 1130-1133; MAL code, display positions 65-67, from 1127-1129.
5. Retrieve residue file 1130-1133 overflow (residue code 5) if any.

(continued)

TABLE 3 (continued)

6. 638-640 \neq b; 644-647 \neq b; 657 = D; pick up first date with D associated with it from R.P. 1237-1240 (1236=D) or from residue file overflow (residue Code M).

7. Next suffixed JCN with same base number within date; BU NO. etc. sort category.

Legend:

b = blank (meaning no data in file position indicated)

D, R, T, U, R = 3 M system action-taken codes

T/47, for example, indicates a "T" in record position 47.

Numbers indicate file record position except when preceded by "P.P." indicating print positions.

Row 4: Maintenance data reported by level 2 maintenance crews in repairing a sub-assembly of a removed repairable item off-equipment. The JCNs associated with row 4 are suffixed JCNs.

Corresponding to any given system BU/SER for a given date there may be a multiplicity of each of the above defined rows, dependent upon the number of JCNs of the given date, number of suffix actions under each JCN, multiple replacements of failed material items under the same JCN, etc.

4.1.6 Special Notes on Multiple-purpose and Optional Data Columns

It can be seen from Table 1 that columns numbered 8, 15, and 19 do not apply to all rows of the display. The display will always be blank at the row print positions identified by the "NA" symbol of the table.

Columns 18 and 20 of the display are multiple-purpose columns.

For rows 1 and 2, Column 18 displays the configuration baseline number of the work-unit-coded item worked on, or removed. When data in this column appear on row 3 or 4, the numbers are for the quantity of items removed.

Column 20, for rows 1 and 2, displays the configuration baseline number of the system being worked on, or from which a repairable item is removed. This is not necessarily the same as the configuration baseline number of the item being removed, or worked on, as indicated by the reported WUC and displayed in Column 18.

On row 4, Column 20 is used to display the reference symbol of a removed subassembly.

Configuration data and reference-symbol data are not supplied from 3M CT records. This information must be obtained from other sources and entered into the MDCS-983 file through the supplementary or up-date process provided. When the file has not been supplemented with these data, these print positions of the display will be blank.

4.1.7 Totals and Page Partitioning

A total row is printed at each change of BU/SER (column 2) to show the total aircraft flights, subsystem-use flights, and cumulative aircraft flight hours on each individual system for the specified data range.

A new page is started whenever there is a change in organization code (column 5) and/or a change in Type Equipment Code. When the code changes, the title block will show the new code.

4.2 System Reliability Summary Display

4.2.1 Purpose

This display provides a record of system reliability statistics for individual systems and groups of systems. It provides data for the estimation of reliability trends by supplying indices based on a selected, limited ("current") period and also on a longer ("cumulative") period (which would include the current period). Mathematical symbols are used to flag the individual system, and group (organizational) statistics indicate deviation from the overall statistics for all groups combined (i.e., to the type-equipment statistics, including all organizations).

4.2.2 General Description

This display summarizes the reliability statistics shown in the heading descriptions of the following section. It includes the counts of maintenance action, verified complaints, aircraft flight, system flight, and system operate hours, for individual systems, groups of systems, and all displayed groups combined.

4.2.3 Detailed Contents of Display Columns

The names of the data elements and their abbreviation for each of the columns of the display are shown in Table 1, Display 2.

Two rows of data are printed for each individual subsystem. The first row gives the data for a "current" surveillance period; the second row for a specified "cumulative" surveillance period. The cumulative period may begin at the same point in time as the current period, or it may begin before the current period. The cumulative period begins on the Julian date shown in the title block following the words, "Cumulative Since". The length of the current period is shown in the title block by the Julian dates following the word "Period". Both the current and cumulative periods end on the same date, i.e., the end date for the current period.

TABLE 1
Display 2

SYSTEM RELIABILITY SUMMARY CONTENTS

Col. No.	Data Elements	Col Heading	Print Positions
1	Serial number of the equipment* followed by the configuration baseline number for the equipment	BUNO System/Cnfg	1-11
2	Number of system maintenance actions	No. M.A.	19-23
3.	Number of system verified complaints	No. V.C.	25-29
4.	Aircraft flight hours	Flight Hrs A/C	31-38
5.	Subsystem Flight Hours**	Flight Hrs SYS	40-47
6.	Mean aircraft flight hours between maintenance actions on the subject subsystem. (FLIGHT HRS A/C ÷ No. M.A.) plus deviation indicator when applicable.	MFHBA A/C	49-59
7.	Mean Subsystem Flight Hours Between Maintenance-Action on the subject subsystem (FLIGHT HRS SYS ÷ No. M.A.) plus deviation indicator when applicable.	MFHBA SYS	61-71
8.	Mean Aircraft Flight Hours Between Verified Complaint on the subject Subsystem (FLIGHT HRS A/C ÷ No. V. C.) plus deviation indicator when applicable.	MFHBVC A/C	73-83

* This is the "Bureau Number" of the aircraft if the equipment of interest is an aircraft installed subsystem. If the equipment is GSE, it is the equipment serial number. The configuration baseline number is that of the subject aircraft installed subsystem or GSE equipment.

** This is a subset of the aircraft flight hours; it is the number of aircraft flight hours on missions which would require use of the subject subsystem of interest, as determined from flight-purpose codes associated with reported aircraft flight hours.

(contd)

AD-A061 156

ARINC RESEARCH CORP ANNAPOLIS MD
RELIABILITY, MAINTAINABILITY, AND AVAILABILITY CHARACTERISTICS --ETC(U)
JUN 72 F E ERDLE
983-02-1-1176

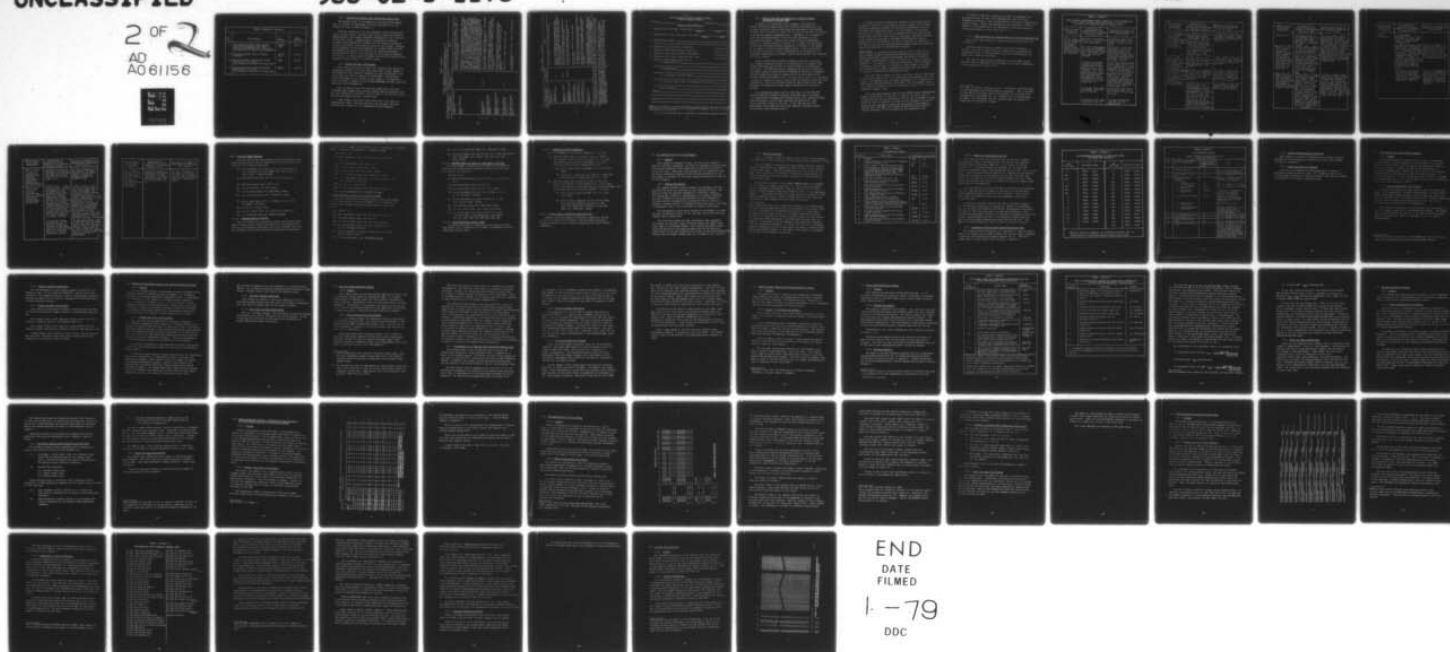
F/G 17/9

N00019-71-C-0355

NL

UNCLASSIFIED

2 OF 2
AD
A061156



END
DATE
FILMED

1-79
DDC

TABLE 1 DISPLAY 2 (continued)

Col No.	Data Elements	Col Heading	Print Positions
9.	Mean Subsystem Flight Hours Between Maintenance Actions on the subject subsystem ($\text{FLIGHT HRS SYS} \div \text{No. M.A.}$) plus deviation indicator when applicable.	MFHEVC SYS	85-95
10.	Subsystem Operate Hours on subject subsystem	OP HRS SYS	97-104
11.	Mean Time Between Maintenance Action ($\text{OP HRS SYS} \div \text{No. M.A.}$) plus deviation indicator when applicable	MTBA	106-116
12.	Mean Time Between Verified Complaint ($\text{OP HRS SYS} \div \text{No. V.C.}$) plus deviation indicator when applicable	MTBVC	118-128

4.2.4 Information Required When Requesting Display Runs

The desired scope of the display for any particular display run is obtained by specifying the control parameters for the display as shown in Table 2, Display 2.

With the exception of the Type Equipment Codes, Organization Codes, current period JCN date range and the cumulative period's beginning date, the control parameter information is not displayed in the title block. Display-request documentation should be initiated and retained as a reference to the sampled systems and related information controlling the scope of the display. However, this information can be made available in computer print-out form by printing the output of the part of the computer-programmed algorithm which selects the field data for processing to generate the display. A sample request document form used for display control purposes by ARINC Research is shown in Figure .

4.2.5 Totals and Page Partitioning

Total rows, which sum the flight hour, operate hour, MA, and VC columns, and display the overall group statistics values, appear in the display at each change in organization code (as printed in the title) when the order of display is TE/ORG/BUNO. Additionally, total rows appear in the display at each change in configuration when the order of display option TE/ORG/CONFIG/BUNO has been specified among the control parameters.

When the data for the last specified organization has been printed, a page change occurs and the overall sums and statistics for the type equipment are printed. This is always a one-row total which does not distinguish between configurations.

A page change occurs after each totals row at the end of an organization's data. The title block on the new page indicates that the data concern the new organization being displayed.

TABLE 2, DISPLAY-2

CONTROL PARAMETERS FOR THE SYSTEM RELIABILITY DISPLAY
(To be Specified when Requesting Display Runs)

Ref.	Parameter and (D.E. in File Format)	Location, R.P. In File Format	Notes
1.	Current period JCN date range (2)	4-7	Specify two 4-digit, julian date numbers, "begin" and "end", to signify the desired range of data to be selected from the MDCS file.
2.	Operate Hours* Date Range		Specify two, 3-digit, date numbers, "begin" and "end" to signify the desired calendar months range of operate time data to be selected from the supplemented ASD file. The first digit of these numbers shall be the last digit of the designated calendar year. The next two digits shall signify the month; 01 = January; 12 = December. When these dates are not specified, operate hours will not be displayed. When an operate hours date range is specified this range and the current period date range must include a period consisting of whole months and the calendar periods signified by the two sets of date range numbers must be identical.
3.	Type Equipment Codes(6)	14-17	Up to 25 codes; program defaults to all on file except blanks in file, if none are specified.
4.	Current Period Index Deviation Limit in Percent		Specify the percentage limit for allowed deviation (+ or -) of individual system indices from the group indices for flagging purposes. (Default to 20% if none is specified.)
5.	Cumulative Period Index Deviation Limit in Percent		Specify the percentage limit for allowed deviation (+ or -) of group indices from the overall type equipment indices. (Default to 20% if none is specified)
6.	The begin JCN date for the cumulative period (2)	4-7	Specify one, 4-digit julian "begin" date.
7.	The begin OP Hr. Date for the cumulative period	--	A 3-digit-number, as in Ref. 2 above, specifying the year and month.

TABLE 2, DISPLAY 2 (continued)

Ref.	Parameter and (D.E. in File Format)	Location, RP In File Format	Notes
8.	Specific Systems Designator (a) By list of organization Codes(1) (b) By list of BU/SER numbers (7) (c) By list of configuration baseline numbers (29) (d) Work Unit Codes (first four characters) (e) A combination of alternatives (a) and (b) (f) A combination of alternatives (a) and (c)*	1-3 18-23 129-132	Specify according to the following alternatives: Up to 25 organization codes; the program will allow induction of all organizations except blanks when none are specified. When this alternative alone is specified the display will include data on all systems of the specified organization. Up to 100 numbers (six digits each); the program will include all on file if none are specified. Up to 25 numbers (4-digit each**). The program will include all on file if none are specified. Up to 25 codes; default to all except blanks if unspecified. The display will include all system configurations within the organizational and BU/Serial list limits. The display will include all systems, by Bu/Ser within the organizational and configuration baseline limits specified.
9.	Order of Display Designation		Specify: TE/ORG/CNFG/BUNO if the order of display is to be BU/SER within configuration baseline numbers, within organization, within type equipment, categories, if none is specified the order of display will be TE/ORG/BUNO.

* The display of operate hours and the indices, MTEA and MTRVC, will be omitted, unless, the file has been supplemented with operate hour data from sources other than the 3-M ASD data collection system.

** This alternative is not available unless the MDCS file has been supplemented with configuration baseline information from sources other than the MDCS. When configuration data are entered into the file (position 129-132) the records for any systems for which the 4-digit configuration baseline numbers are unknown shall have file record position 129-131 filled by the characters OTH, indicating "other", and record position 132 shall be left blank. Then, "OTH", will appear on the display for these systems.

FIGURE 4

983 MDCS/ASD FILE DISPLAY REQUEST DOCUMENT
SYSTEM RELIABILITY DISPLAY

Run Date _____ Request Date _____

Display Control Parameters

1. Current Period Date Range: (Julian Date) _____ to _____
(begin) (end)
2. Current Period OP Hrs. Date Range: (Cal yr/mo) _____ to _____
(begin) (end)
3. Type Equipment Codes: _____

4. Current Period Index Deviation Limit (%) _____
5. Cumulative Period Index Deviation Limit (%) _____
6. Cumulative Period Begin JCN Date (Julian Date) _____
7. Cumulative Period Begin OP HRS Date (Cal. yr/mo. _____
8. Specific System Designator (see note 1)
 (a) Organization Codes: _____

 (b) BU/SER Number: _____

 (c) Configuration Baseline Numbers: _____

 (d) Work Unit Codes (first four characters) (see Note 2) _____

 Order of Display: _____

Remarks: _____

NOTES: (1) In order to identify the specific systems on which data will be selected from the file for the display, specify according to alternative (a), (b), (c), (d), (a) and (b), or (a) and (c).

(2) At least one WUC must be specified to identify the subsystem interest.

4.2.6 General Criteria and Approach to Counting System Maintenance Actions (MAs)

In order to be consistent with acceptable definitions of system reliability indices which are derivable from MDCS data, the accurate counting of MAs and VCs using the maintenance data records requires that a relatively complex set of rules be followed and results in extensive computer-programmed logic. Basically, it is desired to count one system maintenance action for each maintenance event involving the system. Such an event might follow an operational mission, or several missions in series, if a series of missions was successfully performed without degradation or failure of the system to the extent of requiring maintenance action. Only one MA should be counted for each such event, regardless of the multiplicity of individual subassembly maintenance actions which may have been required to fix the system.

Using the MDCS data, a count, according to the above criterion, is a complex procedure because of the multiplicity of computer-card records which make up the sets of records needed to describe each job action. The difficulties are compounded by the use of different JCN numbers without cross-reference indexing to identify on-equipment and off-equipment maintenance actions which are all a part of the singular system maintenance event- the event which needs to be identified in order to obtain an accurate count of MAs for system-reliability-index computation. Also, the procedure needs to take account of the high frequency of missing CT records usually experienced in batches of 3M data.

The counting procedures used in connection with the MDCS-983 System Reliability Display overcomes these MDCS induced problems to a large extent by making use of maintenance level, when-discovered, type-maintenance, action-taken work-unit, and malfunction codes in the records, as well as the JCN. If the JCN work unit and maintenance level codes only are used, multiple counting, contrary to the above criterion, may result.*

In order to enhance further the realism of the derived system reliability indices, it is necessary to use a variant of the above described counting procedures for unscheduled maintenance actions resulting from inspection events. It is necessary to count some, but not all, of these since (1) the system does accrue operate time during inspection which may result in additional legitimate failures of the system (2) there may be failures resulting from previous mission use, in the system at the time of induction to inspection (3) some of the actions resulting during inspection may be inspection induced failures and not legitimately countable.

*For example, in counting procedures such as the one used for the "Fleet Weapon Systems Reliability and Maintainability Statistical Summary Tabulation" (Standard Navy Report No. M50-4790.A2142.01) the number of maintenance actions is defined as: "Total Maintenance Actions:" -- the number of unschedule maintenance actions initiated as reported in card codes 11, 21, and 31. Each change in the JCN, less suffix, within a given component-level work-unit code (first five digits) constitutes a maintenance action.

When this MSO procedure, is used, a multiple count of maintenance actions would result from a case involving an on-equipment job, plus several off-equipment jobs following immediately as a consequence of deficiencies discovered during check-out of the on-equipment repair -- and, therefore, belong to the same maintenance event, which should be assigned a singular count.

The counting procedures used for this ARINC Research MDCS/ASD-983 display avoids error in counting, in cases of the above kind, by recognizing that the when-discovered code for the on-equipment action should be coded to indicate discovery of the discrepancy by the air crew and that subsequent removal and replacement (off-equipment) actions within the same event should be when-discovered coded to indicate discovery of the discrepancy by the maintenance crew.

In order to make the counting as accurate as possible*, the maintenance-event records in the MDCS-983 file have been type-designated according to work classifications and state-of-completeness classifications. These type-designations are explained in Table 3, Display 2, and referenced in the statements of detailed rules for counting maintenance actions in Section 4.2.7.

4.2.7 Detailed Rules for Counting MAs and Verified Complaints VCs

The record types referred to herein have been defined in Table 3, Display 20.

Verified complaints are a subset of the total maintenance actions. They are the MAs which are classified, by observing the action-taken code, as actions wherein repair, or adjustment, of the system was a genuine requirement.

The count of MAs and VCs is performed on those MDCS records selected from the MDCS-983 file according to the control parameters of the display (see Section 4.2.4).

*In order to achieve counting accuracy, even when a high percentage of the maintenance-event records may be incomplete (due to omission of some CTs of the record sets of CTs because the error-detection and-correction procedures were not carried out in a timely manner by MDCS), it is necessary that the counting logic be capable of using even the incomplete records.

TABLE 3, DISPLAY 2

ARINC RESEARCH MAINTENANCE RECORD (MDCS-983) TYPE DESIGNATIONS
(For Use When Counting Total Maintenance Actions for
Reliability and Maintainability Computations)

ARINC Research Record Type Designation	Description of Maintenance Action Related to 3M Card-Type Records on File	Description Related to ARINC Research MDCS-983 File Records
<p>TYPE-1, only L-1 on-equipment action (after discovery of discrepancy during flight operation) have been performed and reported.</p>	<p>a) Level-1 records on CT's 11, 12, and 16, or 17 are applicable.</p> <p>b) A true on-equipment MA; only on-equipment work records are inclu- ded. CT's other than the above are non- existent.</p> <p>c) This record type includes records re- porting Action-Taken codes "A, B, C, Z, 1 through 9" and condi- tionally, "Y". (See detailed instructions for counting total maintenance actions for definition of the conditions on action- taken code Y.)</p> <p>d) Records report When- Discovered codes "A, B, C, D or E".</p> <p>e) Records report Type Maintenance code "B".</p>	<p>a) Primary work center efforts recorded in Sec- tions I and II of the file.</p> <p>b) Other file sections are blank, except for possible Level-1 sup- port documentation of stop work, trouble-shoot, or assisting Work Center actions in Sections V, VI, VIII, and IX.</p> <p>c) Records report Action- Taken codes "A, B, C, Z, or 1 through 9," in file position 47 and/or condi- tionally Action-Taken "Y" as identified by the presence of an Action- Date in file positions 1116-1119. (See de- tailed instructions for counting total mainten- ance actions for defini- tion of the conditions on action-taken "Y".)</p> <p>d) Records report When- Discovered codes "A, B, C, D, or E" in file pos- ition 45.</p> <p>(e) Type maintenance code "B" in file position 46.</p>

ARINC Research Record Type Designation	Description of Maintenance Action Related to 3M Card-Type Records on File	Description Related to ARINC Research MDCS-983 File Records
TYPE 1.1 Only L-1, on-equipment actions (for discrepancy discovered during inspection operations) have been performed and reported.	(a) Records identified the same as for Type-1, except having When-Discovered codes "F,G, J, K, M, N, P or Q". These are segregated from the regular Type-1 designation because special procedures are required for counting them when deriving the count of total maintenance actions.	(a) Similar to the case of Type-1 records, except, the When-Discovered, Type-maintenance, and Action-Taken codes.
TYPE 2, Off-Equipment work, but only L-1 actions to remove a repairable component (after discovery of discrepancy during flight operations) have been reported, although, the complete maintenance event includes L-2 work to repair a removed item.	(a) The file includes Level-1 records on CT's 21, 26, and 27 (with possible support action documentation on CT 11's). (b) Only off-equipment work for the removal of a repairable component by Level-1 maintenance personnel has been filed. (c) The file is incomplete in that the accompanying Level-2 off-equipment reports of the repair of the repairable item removed at Level-1 have been lost or delayed. (All or some of the CT's 11, 12, 31, 32, or 34; especially the CT 31 card, with JCN matching the above mentioned Level-1 21's, 26's, or 27;s may be unavailable).	(a) Primary work center data elements are recorded in Sections I and II of the file. (b) Other file sections are blank, except for possible data elements of Level-1 support documentation, in Sections V, VI, VIII, and IX. (c) Sections of the file record reserved for L-2 data are blank whereas they should be filled.

ARINC Research Record Type Designation	Description of Maintenance Action Related to 3M Card-Type Records on File	Description Related to ARINC Research MDCS-983 File Records
<p>TYPE-2(cont.)</p> <hr/> <p>TYPE 2.1 only L-1 actions to remove and replace repairable component (discrepancy discovered during inspection operations) have been reported, although, L-2 work was also performed</p> <hr/> <p>TYPE-3 Both L-1 and L-2 actions were performed and are reported (for repair of discrepancies discovered during flight operations)</p>	<p>(d) Requirements on Action-Taken, When Discovered, and Type-Maintenance codes are the same as for Type-1 records</p> <hr/> <p>(a) Records identified the same as for Type-2, except having When-Discovered Codes "F", "G", "J", "K", "M", "N", "P", or "Q". These are segregated from the regular Type-2 designation because special procedures for counting them when deriving the count of total maintenance actions are necessary due to the missing data</p> <hr/> <p>(a) The records on hand constitute a complete off-equipment work report file including Level-1 reports for removal of a repairable item from a system (21, 26, and 27 CT's, with possible Level-1 support documentation on CT 11's). Also, included are Level-2 reports (under the same JCN) on the repair of the removed repairable item resulting in non-suffixed 31, 32 and 34 cards, with (continued)</p>	<p>(d) Action-Taken, When-Discovered, and Type-Maintenance codes are the same as for Type-1 records and located in the same file positions, respectively.</p> <hr/> <p>(a) Similar to the case of Type-2 records, except, the When-Discovered, Type-Maintenance, and Action-Taken codes. Sections of the file reserved for L-2 data are blank whereas they should contain data.</p> <hr/> <p>(a) Level-1 Primary Work Center data elements are recorded in Sections I and II. The record has action-taken code "R" in file record position 47. When discovered and type maintenance codes (R.P. 45 and 46) are the same as for Type 1 records. The action taken code for Level-2 is in Section II R.P. 409.</p>

ARINC Research Record Type Designation	Description of Maintenance Action Related to 3M Card-Type Records on File	Description Related to ARINC Research MDCS-983 File Records
TYPE-3 (continued)	<p>a) (continued) possible Level-2 11 and 12 cards to report stop work, or other support documentation.</p> <p>b) When-Discovered, Type-Maintenance, and Action-Taken code requirements are the same as for Type-1 records. However, the When-Discovered and Type-Maintenance codes of interest are those contained redundantly on the 21, 31, and 32 CT's; the Action-Taken codes of interest are those reported on the 31 cards only.</p> <p>c) The CT 21 record reports an Action-Taken code "R," indicating the removal and replacement in the system of a repairable component.</p>	<p>b) Level-1 support actions (stop work, assisting work center actions, etc.) if any, are contained in Sections V, VI, VIII, and IX of the file in Level-1 designated positions.</p> <p>c) Level-2 Primary Work Center data elements are recorded in Section II of the file, with possible action documentation, if any, in Sections V, VII, VIII, and IX.</p>

ARINC Research Record Type Designation	Description of Maintenance Action Related to 3M Card-Type Records on File	Description Related to ARINC Research MDCS-983 File Records
TYPE 3.1 Both L-1 and L-2 actions were performed and reported (Discrepancy discovered during inspection operations)	(a) These records are identified the same as for Type-3, except they have When-Discovered codes "F, G, J, K, M, N, P, or Q".	(a) This description is the same as for Type-3 records, but incorporating the change in designated When Discovered codes.
TYPE-4 Both L-1 and L-2 work was performed but only L-2 reported (discrepancy discovered during flight operations).	<p>(a) This type of record represents the case of an incomplete off-equipment work report file. The Level-2 maintenance actions reports are present, but the Level-1 reports are lost or delayed. Documentation at Level-2 would include CT 31 and 34 cards with 32's, if failed parts were removed, and the necessary CT 11's and 12's if support documentation were required.</p> <p>(b) The card coding requirements are the same as for Type-3 records, except there would be no CT 21s from which to verify that the Level-1 action-taken code was "R".</p>	<p>(a) In this case only the Level-1 data elements which are present on Level-2 3M cards, through redundancy in the 3M system would appear in the record in Sections I and II. Therefore, the When-Discovered and Type-Maintenance codes would appear in file positions 45 and 46, respectively. Also, Level-1 data may be deficient in file Sections V, VI, VIII, and IX, but dependent upon the combinations of Level-1 3M cards existing, or delayed.</p> <p>(b) The Action-Taken codes of interest would be found in file position 409, the same as the case for Type-3 records. These would be no Action-Taken "R" code in R.P. 47 to verify remove and replace action at L-1 maintenance.</p>

ARINC Research Record Type Designation	Description of Maintenance Action Related to 3M Card-Type Records on File	Description Related to ARINC Research MDCS-983 File Records
Type 4.1 Both L-1 and L-2 work performed but, only L-2 actions reported (discrepancy discovered during inspection operations).	(a) These records are identified the same as for Type-4 records, except they have When-Discovered codes "F, G, J, K, M, N, P, or Q".	(a) This description is the same as for Type-4 records, but incorporating the change in designated When Discovered codes.

4.2.7.1 Counting Type-1 Records

Count one system-level maintenance action within each serial-number category when a record (identified by a non-suffixed JCN) satisfies the following conditions.

- (1) Type Equipment code (T.E.), R.P. 14-17 = Specified T.E. and Work Unit code (WUC), R.P. 38-41 (four of seven digits = Specified WUC)
- (2) When Discovered code, R.P. 45 = A, B, C, D, or E
- (3) Type Maintenance code, R.P. 46 = B
- (4) L-2 Action Date, R.P. 409 = blank
- (5) L-2 Stop Work date, R.P. 1066-1069 = blank
- (6) L-2 T.S. Action Date, R.P. 1130-1133 = blank
- (7) Action Taken code, R.P. 47 = blank, A, B, C, Z, or 1 through 9, provided:
- (8) If R.P. 47 = blank, then:
- (9) L-1 T.S. Action Date, R.P. 1116-1119 \neq blank, or:
- (10) L-1 Stop Work date R.P. 972-975 \neq blank

4.2.7.2 Counting Type-1.1 Records

Count one system-level maintenance action within each serial-number category when a record (identified by a non-suffixed JCN) satisfies the following conditions, but do not increment the count for subsequent file records (within an encountered serial-number

category) having a same when-discovered code as previously encountered, unless a change in JCN date (R.P. 4-7) has occurred.

- (1) Same as 2.1
- (2) When Discovered code, R.P. 45 = F, G, J, K, M, H, P, or Q
- (3) Type Maintenance code, R.P. 46 = B
- (4) L-2 Action Date, R.P. 409 = blank
- (5) L-2 Stop Work code, R.P. 1065 = blank
- (6) L-2 T.S. Action Date, R.P. 1130-1133 = blank
- (7) L-1 Action Taken code, R.P. 47 = blank, A, B, C, Z, or 1 through 9, provided:
- (8) If R.P. 47 = blank, then:
- (9) L-1 T.S. Action Date, R.P. 1116-1119 ≠ blank; or
- (10) L-1 Stop Work date R.P. 972-975 ≠ blank

4.2.7.3 Counting Type-2, Type-3, and Type-4 Records

Count one system-level maintenance action within each serial-number category when a record (identified by a non-suffixed JCN) satisfies the following conditions (record type-2, type-3 and type-4).

- (1) Same as 2.1
- (2) When Discovered code, R.P. 45 = A, B, C, D, or E
- (3) Type Maintenance code, R.P. 46 = B
- (4) L-1 Action Taken code, R.P. 47 = R, or blank
- (5) L-2 Action Taken code, R.P. 409 = blank, A, B, C, Z, or 1 through 9; except:
- (6) Do not increment the count if both R.P. 47 and R.P. 409 are blank, unless:
- (7) L-2 Stop Work Date, R.P. 1066-1069 ≠ blank

- (8) L-2 T.S. Action Date Code, R.P. 1130-1133 \neq blank
- (9) Do not increment the count if R.P. 47 = R and the Malfunction code (MAL), R.P. 48-50 = 800, 801, 803, 804, 805, or 806.

4.2.7.4 Counting Type-2.1, Type 3-1, and Type 4.1 Records

Count maintenance actions as in (3) above for non-suffixed (JCN) records satisfying the following conditions (record type-2.1, type-3.1 and type-4.1).

- (1) Same as 2.1
- (2) When Discovered code, R.P. 45 = F, G, J, K, M, N, P, or Q
- (3) Type Maintenance code, R.P. 46 = B
- (4) L-1 Action Taken code, R.P. 47 = R or blank
- (5) L-2 Action Taken code, R.P. 409 = blank, A, C, B, Z, or 1 through 9, except:
- (6) Do not increment the count if both R.P. 47 and R.P. 409 are blank, unless:
- (7) L-2 Stop-Work date, R.P. 1066-1069 \neq blank
- (8) L-2 T.S. Action Date, R.P. 1130-1133 \neq blank
- (9) Do not increment the count if R.P. 47 = R, and the first digit of the Malfunction code (MAL), R.P. 48 = 50 = 800, 801, 803, 804, 805, 806

4.2.7.5 Total Maintenance-Action Count

Accumulate the counts of system-level maintenance actions made under 4.2.7.1 through 4.2.7.4, above, to determine the total maintenance-action count.

4.2.7.6 Counting Verified Complaints

Derive the number of unverified complaints as follows.

- (1) Identify those type-1 and type-1.1 records [which were counted under (2) and (3), respectively, above] that satisfy any one of the following conditions, and count one unverified complaint for each:
 - (a) If L-1 Action Taken code/MAL code, R.P. 47-50 = A799
 - (b) If R.P. 47 = blank and R.P. 972-975 = blank and R.P. 1116-1119 \neq blank and 1113-1115 = 799
- (2) Identify those type-2, type-2.1, type-3, type-3.1, type-4, and type-4.1 records [which were counted under (4) and (5) above] that satisfy any one of the following conditions, and count one unverified complaint for each:
 - (a) If L-2 Action Taken code/MAL code, R.P. 409-412 = A799
 - (b) If R.P. 409 = blank and L-2 T.S. Action Date, R.P. 1130-1133 \neq blank, and L-2 T.S. MAL code R.P. 1127-1129 = 799 and L-2 stop work date, R.P. 1066-1069 = blank

4.2.7.7 Derive Count of Verified Complaints (VC)

Subtract the total number of unverified complaints, derived in 4.2.7.6(1) and 4.2.7.6(2), above, from the total maintenance actions, derived in 4.2.7.5 above, to determine the total verified complaints.

4.3 983-MDCS/ASD LRU Reliability Display

4.3.1 Purpose

This display is designed to show, for each major component (LRU) by reference designator, the count of maintenance actions (MAs) and verified complaints (VCs), along with the derived reliability indices for each. Generally, this display will be coordinated with the System Reliability Display to show the LRU statistics for the same sample of systems over the same cumulative-period data range as for that display.

4.3.2 General Description

The display contains fifteen columns, the headings and print positions for which are described in the following sections. The LRUs are listed by reference designator of the major component. In counting MAs, actions on subassemblies of the major components have been credited to the major-component reference designator. The MAs (and VCs) represent action performed both for level 1 on equipment (without removal of repairables) and work done in the shops at maintenance level 2 (for the repair of removed repairables).

The information on each LRU is entered on the display, in order by rank, according to the MA, or VC, rate ($MA \div FH$ or $VC \div FH$) from highest rate to lowest rate.

The title block shows the type maintenance, type equipment, date range, the aircraft flight hours, and system use flight hours which apply to the sampled system. The aircraft and system flight hours are derived by the display program from the ASD file data. These should be the same quantities as derived by the System Reliability Display when the sample systems data are the same for both displays.

4.3.3 Detailed Contents

Table 1, Display 3 lists the names of the displayed data elements, the abbreviated column headings, and the display print positions for each.

In this display no distinction is made between LRU, from various system configurations (as indicated by the third and fourth digits of the work unit code). Since the accumulation of flight hours in the MDCS system is done on a basis which ignores LRU configuration, no adequate information could be gained by listing the LRU indices on a configuration basis.

The reliability index figures MFHBA, MSFHBA MFHBVC, and MSFHBVC, of the display are shown, uniformly, to three significant digits and are expressed in exponential (base 10) notation.⁽¹⁾ The rate figures MA/FH, MA/SFH, VC/FH, and VC/SFH are given to four significant digits*. This does not imply that these ratios are accurate to this extent, since they can be no more accurate than the flight-hour and maintenance-action numbers from which they are derived.

-
- * Each number is written with a units digit, followed by a decimal point and the remaining significant digits of the number, after which there is a "D" followed by an arithmetical minus sign, or a blank space. Following the sign space there are two digits indicating the power of the base 10 by which the ordinary notation number has been divided to obtain the number displayed. The minus sign indicates that the exponent for the power of 10 was negative; the blank space indicates that the exponent was positive. To convert this notation to ordinary numerical notation, move the decimal point the number of places indicated by the exponent number, to the right if the exponent is positive, to the left if the exponent is negative.

TABLE 1, DISPLAY 3
LRU RELIABILITY DISPLAY

Column	Element Name	Heading	Print Positions
1.	Ranking	RANK	1-4
2.	Major component, or LRU reference designator (refer to columns 2-9)	LRU	6-8
3.	Total number of LRU maintenance-actions	MA	10-14
4.	Total number of LRU mas (included under 3, above) which resulted in the finding that the unit was not defective. (The number of times the action taken + malfunction codes reported for the given LRU were "A-799")	ND	16-20
5.	The LRU no-defect rate ($ND \div MA$)	ND/MA	22-30
6.	Mean aircraft flight hours between LRU maintenance action	MFHBA	32-40
7.	The LRU maintenance-action per aircraft flight hour rate	MA/FH	42-48
8.	Mean sub-system use flight hours between LRU maintenance action	MSFHBA	53-61
9.	The LRU maintenance-action per subsystem use flight hour rate	MA/SFH	63-72
10.	Major component or LRU, reference designator (refers to columns 11-15)	LRU	77-79
11.	Total number of verified complaints (the number of MAs which resulted in the finding that the unit was, in fact, defective).	VC	81-85
12.	Mean aircraft flight hours between LRU verified complaint	MFHBVC	87-95
13.	The LRU Verified complain per aircraft flight hours rate	VC/FH	97-106
14.	Mean sub-system use flight hours between LRU verified complaint	MSFHBVC	108-116
15.	The LRU verified complaint per subsystem flight hour rate	VC/SFH	118-127

4.3.3.1 Rules for Counting MAs and VCs

After the data have been selected from the file, the computer processes the data on each LRU, incrementing the MA count only for records having action-taken codes 1-9, A, B, C, and Z in record position 47. If record position 47 is either "R" or blank, the count is incremented only if record position 409 is blank, 1-9, A, B, C, and Z. Records having suffixed JCNs are not counted, nor are records having "R" or blank in record position 47 and "800, 801, 803, 804, 805, or 806 in record positions 48-50 and/or position 410-412. These latter malfunction codes report the removal of items for reasons other than repair of discrepancies.

The total number of VCs for each LRU is determined by subtracting from the total MA count the number of records within the MA count which represent no-defect items that were reported. These records have "A799" in positions 409-412 and are displayed as the total no-defects (ND).

A matrix of work-unit codes (to the 5th of the seven digits) vs. LRU reference designator is used by the computer to consolidate data on the units from systems of different configurations and display all units of like functions under one reference designator. This assures that applicable reliability indices may be computed by using the overall systems flight-hour data. The cumulative flight hours are derived by the display program, using data from the ASD file. The WUC vs Reference Designator matrix is given in Table 2, Display 3.

4.3.4 Information Required When Requesting Display Runs

The Display Control Parameters to be specified in order to obtain runs of the display are the same (except for a default option indicator) as for the System Reliability Display (Display No. 2). These are listed under the LRU display title in Table 3, Display 3.

TABLE 2, DISPLAY 3

LRU REFERENCE DESIGNATORS VS WORK UNIT CODES
FOR RADAR SET AN/APG-59

LRU Ref. Des.	Work Unit Codes		LRU Ref. Des.	Work Unit Codes	
1	74241	74251	15	7424H	7425H
2A2	74242	74252*	16	7424J	7425J*
2A4	74243	74253*	17	7424K	7425K*
3	74244	74254*	2A5	7424L	7425L*
5A3	74245	74255*	2A6	7424M	7425M*
6A1	74246	74256*	2A7	7424N	7425N*
6A2	74247	74257	2A1	7424P	7425P*
7	74248	74258	2A8	7424Q	7425Q*
8	7424A	7425A	2A3	7424R	7425R*
9	7424B	7425B	4A1	7424S	7425S*
10	7424C	7425C*	4A3	7424U	7425U*
11	7424D	7425D	4A2	7424T	7425T*
12	7424E	7425E	5A1	7424V	7425V
13	7424F	7425F	5A2	7424W	7425W
14	7424G	7425G	D.D.	7424X	7425X*
			NOC	74249	74259

*WUC not currently assigned, but reserved for future use, if modifications to the system should require these codes.

TABLE 3, DISPLAY 3

LRU RELIABILITY DISPLAY

Display Control Parameters (File Data
Selection Criteria)

Refer- ence	Parameter (Data Element, DE, in File Format)	Location, Record Position (RP), in MDCS-983 file Format	Notes
1	JCN Date Range (2)	4-7	One date range only: Julian dates, from-to inclusive
2	Type Equipment Codes (6)	14-17	Up to a maximum of 50 codes
3	Specific Systems Designator (a) Action Organization(1) (b) List of BU/SER Numbers (7) (c) Configuration Number (29) (d) Work Unit Code(12) (e) Combination of (a) and (c) (f) System Designator Unspecified	1-3 18-23 129-132 38-44	Specify according to the following alternatives: Up to a maximum of 50 codes Up to a maximum of 1000 codes 4-character configuration numbers only, up to a maximum of 25 numbers Specify the first four digits of the 7 character work unit codes for up to 1000 codes. See (a) and (c) above Display includes all systems in file within scope established by the other control parameters
4	Type Maintenance (14)	46	Up to a maximum of 50 codes
5	Action Taken (15)	47	Up to a maximum of 50 codes
6	When Discovered Code (13)	45	Up to a maximum of 50 codes
7	Default Option Indica- tor	--	Specify Indicator Y if it is desired to include on the display records having any of the specified control parameter position blank; otherwise, the display will not include records having blanks in specified control parameter positions.

4.3.5 Specific System Display Limitation

This display is limited to displaying the specific reference designators and processing the specific work unit codes assigned to radar set AN/APG-59.

4.3.6 Totals and Page Partitioning

The rows of the display are independent, and no totals of individual column figures are made. The AN/APG-59 radar set has 31 major LRUs, as defined for display purposes, which does not exceed the capacity of one computer print-out page.

4.4 LRU Maintenance Actions Summary Display

4.4.1 Purpose

This display provides a listing of the count of maintenance actions (MAs), verified complaints (VCs), and number of no-defect-discovered (ND) actions for each LRU and LRU subassembly reported by the data sample. It does not combine the subassembly, or the system configuration, identifiers under the major LRU reference designator, as is the case for the LRU reliability display. It provides resolution if the MA, VC, and ND counts according to BU/SER and organization categories. This display is essentially an amplification of the LRU reliability display.

4.4.2 General Description and Contents

The data are displayed in eight columns headed "WUC", Work Unit Code; "ORG", Organization; "BU/SER", Bureau Number or Serial Number; "CONF", Configuration Baseline Number (of the system from which the LRU was removed*); "MA", maintenance actions; "VC", Verified Complaints; and "ND", No-Defect-Discovered Maintenance Action. The VC and ND categories are sub-sets of the MA category.

This display is intended to be derived from the same sample of data that would be used for the LRU reliability display. The display control parameters are the same as for the LRU reliability display, and it is intended that these two displays always be requested simultaneously.

*These data must be provided to the 983-MDCS file from sources other than 3M by associating configuration with BU/SER numbers.

4.4.3 Specific Display Limitations

The LRU Maintenance Actions Summary Display is limited to the display of LRUs for the radar set AN/APG-59. This is due to the structure of the computer program in that it incorporates a matrix to identify the WUCs with the reference designators as described under the LRU reliability display.

4.4.4 Totals and Page Partitioning

Each change in configuration baseline listings within each WUC (to the sixth character) category involves a configuration sub-total row.

Each change in WUC, sixth character, within fourth- and fifth-character category involves a sub-assembly total row.

Each change in WUC, fifth character, within fourth-character category (system configuration category) involves a WUC sub-total row.

A page change, with repetition of title block, occurs after each WUC sub-total. Therefore, each major LRU is listed with its sub-assemblies on an integral number of pages.

4.5 Display of Reliability Indices for LRU and Functional Groups

4.5.1 Purpose

In most complex systems, the physical work-unit packages do not identify complete functional groups of hardware. It is usually necessary, in defining engineering-improvement needs, to investigate the reliability of the hardware performing integral functions (e.g., transmitter, receiver, etc.). It is the purpose of this display to provide the same reliability indices given on the LRU reliability display, but grouped according to radar-set functions. Additionally, the display supplies the corresponding indices for each functional group similar to those supplied for each LRU.

4.5.2 General Description and Contents

The radar-set LRUs are identified by reference designator. The reference-designator failure rates and reliability indices are grouped according to LRU allocation to functional group. The failure rates are summed to provide a group failure rate, and the group failure rate and reliability index are shown on the sum row for each group. As in the case of the LRU reliability display, the failure rates and indices are given in exponential notation. (See the description of the LRU Reliability Display for explanation of this notation).

The display is produced in four separable sections corresponding to the four reliability indices given for each LRU on the LRU Reliability Display.

At the end of each section the group failure rates are consolidated to provide a calculation of "LRU derived" system reliability and failure-rate indices. These system reliability numbers are useful for engineering-estimate purposes. However, they should not be confused with the system reliability indices given by the system reliability display. The system "mean time" indices derived through use of this display will, generally, be lower than the true system reliability because, for purposes of this calculation, every

LRU failure is assumed to be the equivalent of a system failure. However, in the system reliability display, multiple failures of LRUs within a singular system count only as one system failure.

4.5.3 Specific Display Limitation

This display is limited to use on the AN/APG-59 radar set. The relationships between work unit codes and reference designators have been made an integral part of the computer program.

4.5.4 Total Rows and Page Partitioning

This is a two-page display. The first page includes the grouped LRU statistics and overall statistics for all the groups. On the second page the statistics for the groups are consolidated to display LRU-derived system statistics.

4.6 Replaced Failed Material Display

4.6.1 Purpose

This display shows the failed material replaced by levels 1 and 2 maintenance during repairs on systems and LRUs. It includes subassemblies of LRUs when these have been listed on the MAF's as failed material. Replacement rates, for each part listed, are also displayed. In practical circumstances this display would be used to list the failed material reported in the same batch of data used to derive the system reliability and LRU reliability displays.

4.6.2 General Description and Contents

In a six-column display the replacement rates and quantities of each failed material item are listed within subassembly or LRU work-unit-code (WUC) category within part-number category (or reference designator category if the failed material was reported by this type of identifier).

Three replacement-rate indices are given-- one in terms of aircraft flight hours (quantity divided by aircraft flight hours, QTY/ACFH); another in terms of subject subsystem flight hours* (quantity divided by subsystem flight hours, QTY/SYSFH); and a third based on subsystem operate hours (QTY/SYSOPH)**.

* These flight hours are a subset of aircraft flight hours - that set which represents flights during which use of the specific subsystem would be required as determined from reported flight-purpose codes.

** The 983-ASD file must be supplemented by operate-time by data from other than 3M sources in order to provide these indices based on subsystem operate time. When operate time is not provided, these display columns will be blank.

LRU which are work-unit coded within two categories of system configuration (7424 and 7425 series WUC) are displayed in separate groupings. However, the replacement rate indices are given only on a basis of combined system-configuration total quantities. This is necessary since the 3M data do not supply time data with reference to LRU configuration, nor to system configuration.

The applicable type-equipment and type-maintenance codes are displayed in the title block, as are the date-range (Julian dates), display-date (calendar date), section number, and operate time statistics. These items are discussed in later sections of this description. Also, as indicated by the parenthetical note in the title block, the display of individual quantities of parts per WUC item can be limited by specifying the applicable limit as a display control parameter when requesting display runs. This is a useful feature when very large volumes of data are to be processed, since it offers a way of limiting the volume of paper generated by the computer. Because the individual quantities dropped from display are included in the quantity numbers on the total rows the only information lost is that related to LRU or subassembly use of low-replacement-rate parts. Of course, the display of all quantities may be obtained by specifying a limit of 1 as one of the display control parameters.

4.6.3 Information to be Supplied When Requesting Display Runs

This display does not use the ASD data file to derive the operate-time statistics. These statistics must be supplied as an input to the display program. Provisions are made in the program for the input of only one set of operate-time statistics (ACFH, SYSFH, and SYSOPH). Therefore, the display control parameter specifications must be limited to the specification of only one type-equipment code.

The same display control parameters that were used for the LRU Reliability Display, with the addition of the operate-time statistics and a limit on quantity-data to be printed, may be applied for this display if the limitations mentioned above and in Section 4.6.4

are observed. If it is desired to obtain this display in conjunction with System or LRU Reliability Display runs of wider scope (re: type-equipment and work-unit codes), then it will be necessary merely to include in the computer algorithm an additional sort of the data batch used to limit its content to that which is required for this display.

4.6.4 Specific System Limitations

The display program can be used to display data only on a singular subsystem of a singular type equipment reported by 3M data. Also, it is limited to operating on not more than two configurations of the subject subsystem. The set of control parameters for the display may include up to two 4-digit work unit codes to designate the specific system. The first two digits of both codes (the system-type identifiers) must be the same digits. The third and fourth digits of the WUCs may be different (e.g., WUCs 7424 and 7425 specify two system configurations of the AN/AWG-10 MCS, radar set, AN/APG-59).

4.6.5 Totals and Page Partitioning

Within each part-number category, a total row for each major component ("MAJ COMP (LRU) TOTAL") is involved whenever there is a change in WUC fifth digit, disregarding both categories of system configuration. The individual quantity totals for each subassembly (WUC sixth digit category) are consolidated on this row, and the replacement rate indices for the LRU are displayed on the basis of the quantity total.

At each change of part number, three total rows are involved. The first of these total rows ("PN TOTAL - 1st CONF"), Part Number Total - First Configuration, gives the total quantity of the subject part reported for the system whose configuration was designated by the lower-numbered identifier (third and fourth digits of the WUC).

The second of these total rows gives the quantity of the subject part reported for the other system configuration. The last of these three total rows gives the combined quantity of subject part reported for both configurations and the replacement-rate indices for this part in the overall system. These three totals are not involved when the fifth digit of the WUC changes from a zero to a non-zero digit. A zero fifth-digit identifies the entire system. Therefore, the totals information would merely be repeating what has already been shown.

As indicated by the section number printed in the upper right-hand corner of the title block, just below the display date, the display is divided into sections consisting of the data on 25 part numbers each. This is done for convenience when it is necessary to divide the total-print-out during analysis procedures to facilitate handling. A page change and repetition of title block is involved with each sectional division.

Also, a page change is involved with each change in type-maintenance category, as indicated in the title block. The section count is reset to one whenever a new type-maintenance category is begun.

4.7 Replaced Major Components and Subassemblies Display

4.7.1 Purpose

This display serves to identify the system major components (LRU) system major parts, and subassemblies reported as replaced by the data batch surveyed. The identification of items is by WUC and part number in order to provide information on the configuration of the items represented in the data batch.

4.7.2 General Description and Contents

The work-unit code for each item is given, followed by a part number (or reference designator*) and the number of items processed ("IP").

On the "Subassembly Total" rows, three replacement rates are given, along with the total IP for items having the preceding common WUC fifth digit. These are the only totals involved. The replacement rates are derived, in the same way as for the Replaced Failed Materials display, disregarding configuration.

The same display control parameter requirements and specific system limitations which are applicable to the display of failed materials apply to this display.

The only page partitioning employed for this display occurs when a change of type-maintenance code takes place. The display is not page-sectioned within type-maintenance category as was the Replaced Failed Materials Display. The title block is repeated only with a change in type-maintenance code; the changed type-maintenance code is displayed in the title block.

*The MDCS rules allow the reporting of an item by reference designator when part number is unknown.

4.8 System Maintainability Display

4.8.1 Purpose

This display provides basic maintainability data. It also provides maintainability indices as ratios of man-hours and elapsed maintenance time to aircraft flight hours, system flight hours, and system operate time.*

4.8.2 General Description

The display is generated in two parts. The first part, entitled "System Maintainability Basic Data Display", shows the basic elements from which the indices are derived. The derived indices are printed on the second part, "System Maintainability Indices Display". The maintainability data and indices are given on an individual system basis within organizational and type-equipment categories as applicable to each selected type-maintenance category specified for the run.

Definitions of the column headings and their contents are given in Section 4.8.3.

Generally, this display would be run using the same batch of data selected from the file for the system and LRU reliability displays. The count of total maintenance actions displayed here will be the same as the corresponding system reliability display.

4.8.3 Detailed Contents

The names of the data elements displayed and the corresponding column-heading abbreviations for the System Maintainability Basic Data Display are given on Table 1, Display 8. Similar information for the System Maintainability Indices Display is provided by Table-2, Display 8.

*These indices (based on system operate time) are available only when the 983-ASD file has been supplemented by operate-time data from sources other than 3M.

TABLE 1, DISPLAY-8

DATA-ELEMENT NAMES AND COLUMN-HEADING ABBREVIATIONS FOR THE
SYSTEM MAINTAINABILITY BASIC DATA DISPLAY

Col No. Reference	Element Name	Heading Abbreviation
1.	Aircraft flight hours - reported during the date range shown in the title block.	ACFH
2.	System flight hours* - reported during the date range shown in the title block.	SYSFH
3.	System operate hours - reported during the date range shown in the title block.	SYSOPH
4.	Number of on-equipment maintenance actions (actions not involving removal of repairable items from the aircraft, or system, for intermediate maintenance shop repair)**	ON-E-MA
5.	Number of off-equipment maintenance actions (actions involving the removal of repairable items from the aircraft, or system, for intermediate maintenance shop repair)**	OFF-E-MA
6.	Total number of Maintenance Actions**	TOTAL MA
7.	Percentage on-equipment maintenance actions (ON-E MA ÷ TOTAL MA) X 100	% ON-E MA
8.	Percentage off-equipment maintenance actions (OFF-E MA ÷ TOTAL MA) X 100	% OFF-E MA
9.	Man-Hours reported**	REPORTED MAN-HOURS
10.	Elapsed Maintenance Time Reported	REPORTED EMT
11.	The number of data records for which, due to incompleteness or other error, no man-hours or EMT are on file for the primary work center which performed the job.	MISSING MH & EMT
12.	The number of man-hours derived through a process of data adjustment to account for incompleteness of man-hours data in the file	ADJ. MAN-HOURS (MH)
13.	The amount of elapsed maintenance time, in hours, derived through a process of data adjustment to account for incompleteness of EMT data in the file	ADJ. EMT (EMT)

* This is a subset of the aircraft flight hours derived through a selection process on the ASD file using specified flight purpose codes to identify reported flight hours applicable to in-flight use of the subject subsystem being analyzed.

**These data elements are, of course, constrained within the categories of (1) the subsystem of the aircraft being analyzed (2) the type equipment and type maintenance shown by the title block.

TABLE 2, DISPLAY 8

NAMES OF MAINTAINABILITY INDICES AND COLUMN-HEADING ABBREVIATIONS
FOR THE SYSTEM MAINTAINABILITY INDICES DISPLAY

Col No. Reference	Index Name	Heading
1.	The Bureau number of the aircraft in which the system is installed or the system's serial number and the system's configuration baseline number*.	BU/SER/CNFG
2.	Adjusted maintenance man-hours per maintenance action	ADJ.MH/MA
3.	Adjusted man-hours per aircraft flight hour	ADJ. MH/ACFH
4.	Adjusted man-hours per system flight hour	ADJ. MH/SYSFH
5.	Adjusted man-hours per system operate hour	ADJ. MH/SYSOPH
6.	Adjusted elapsed maintenance time per maintenance action	ADJ. EMT/MA
7.	Adjusted elapsed maintenance time per aircraft flight hour	ADJ. EMT/ACFH
8.	Adjusted elapsed maintenance time per system flight hour	ADJ/ EMT/SYSFH
9.	Adjusted elapsed maintenance time per system operate hour	ADJ. EMT/SYSOPH
10.	Man-hours and elapsed maintenance time adjustment factor	MH & EMT ADJ. FACTOR

* Configuration baseline numbers are available only when the 983-MDCS file has been supplemented with this information from data sources other than 3M.

The reported man-hours and the reported EMT columns include all man-hours and EMT in the file under maintenance level-1 primary work center and assisting work centers. This includes end-of-job, end-of-accounting-period, troubleshooting, and stop-work category reports. An adjustment factor is applied to the reported man-hours when reports in the file which have been counted as maintenance actions are found to be lacking man-hours or elapsed maintenance-time data elements. In tabulations of the MAs which are lacking MH and EMT data, a record which has only one of these without the other is regarded as having neither and is tabulated as lacking MH and lacking EMT. This procedure is followed because it is felt that the accuracy of either number by itself may be questionable. In implementing this tabulation procedure only the primary, level-1, work center MH and EMT reported at the end of the job (see file format data elements 18 and 19, record positions 53-59) are considered. Other MH and EMT data reporting end-of-accounting-period, stop-work, and troubleshooting data for primary and assisting work centers may be present. However, it is believed that the procedure used will provide the best estimate of true MH and EMT since over a time period that might be expected to yield good statistical results (e.g., a calendar quarter or longer) the majority of MH and EMT will have been reported by the primary work center at the end of jobs.

The computation of the adjustment factor is illustrated below:

$$(1) \text{ Adjustment Factor for MH} = F_{MH} = \frac{\text{Total MA}}{(\text{Total MA}) - (\text{MA Records missing MH})}$$

$$(2) \text{ Adjusted MH} = F_{MH} \times \text{Reported MH}$$

$$(3) \text{ Adjustment factor for EMT} = F_{EMT} = \frac{\text{Total MA}}{(\text{Total MA}) - (\text{MA Records missing EMT})}$$

*See the 983-MDCS file format for the locations of these data elements.

$$(4) \text{ Adjusted EMT} = F_{\text{EMT}} \times \text{Reported EMT}$$

By the rule, stated previously, for tabulating the missing EMT and MH, a record lacking either is regarded as lacking both. Therefore: $F_{\text{MH}} = F_{\text{EMT}}$ and the same adjustment factor number is used to adjust reported MH and reported EMT.

In the event the case should occur where all of the records counted as MA have the MH and EMT data lacking, the denominator of the adjustment factor would be zero. In this case, which should seldom occur if the data-collection controls have been properly implemented, the correction factor would be meaningless. Therefore, whenever $\text{TOTAL MA} = \text{MA RECORDS Missing MH AND EMT DATA}$, the adjustment factor is taken as one. In other words, the MH and EMT which are on file in the end-of-accounting period, stop-work, and troubleshooting sections of the file record for primary and assisting work centers are indicated as the true MH and EMT. This is, of course, erroneous but it is easily recognizable when inspecting the display by observing whether or not the above-mentioned equality of TOTAL MA and MA MISSING MH AND EMT exists.

4.8.4 Totals and Page Partitioning

Total rows for organizational category data are involved at each change of organization. Totals for type equipment, consolidating all organizations within a type-maintenance category, are provided at each change of type maintenance. Page change and title block repetition occur prior to presentation of the type-equipment totals; also, when beginning a new type maintenance. The title block preceding the type-maintenance totals include the word "ALL" following the heading element "ORG" to indicate that the total applies to all organizations listed since the last type-equipment total. The total rows for the individual organizations are indicated on their total rows.

4.9 LRU Maintainability Display

4.9.1 Purpose

This display gives maintainability indices for major components (LRU) considering only off-equipment work as reported by maintenance level-2, Intermediate Maintenance Division, repair.

4.9.2 General Description and Contents

The data and indices displayed are commensurate with those of the System Maintainability display. However, in this case no adjustment of the reported man-hours or elapsed maintenance time is carried out. Only the maintenance records which include MH and EMT data are counted. Also, the operate-time statistics, aircraft flight hours, system flight hours, and the system operate time are inputs to the program rather than being derived from the ASD file, as was the case for the System Maintainability display.

The display references, in the first column, the LRU by reference designator. This is accomplished as a reference matrix input to the computer program, which specifies the reference-designator vs. work-unit-code relationships for the system of interest. The matrix can be altered to allow use of this display for any system reported by the MDCS.

The procedure for counting the MA involves inspection of the level-2 action-taken code for each record of the selected data batch. (See the MDCS-983 file format, data element 78, record position 409.) The MA count is incremented, by one count, for each record having this code equal to 1-9, A, B, C, and Z, except, when the code is A, followed in record position 410-412 by malfunction codes 800, 801, 803, 804, 805, and 806. These codes indicate removal of items for purposes other than repair.

The reported man-hours and elapsed-maintenance time tabulation includes data reported by both primary and assisting work centers for end-of-job, troubleshooting, end-of-accounting period, and stop-work. Suffix JCN records reporting the repair of sub-assemblies are not counted.

The LRUs are listed on the display in accordance with rank by maintenance man-hours per maintenance action (MMH/MA), highest to lowest.

4.9.3 Information Required When Requesting Display Runs

The following display control parameters must be specified to control the selection of data from the 983-MDCS file:

- (1) Date Range - Julian dates, from, to, inclusive; these dates will be machine-printed in the display title block. (The dates should be the same as specified for the system and LRU reliability displays.)
- (2) Operate-Time Statistics:
 - (a) Aircraft flight hours
 - (b) System flight hours
 - (c) System operate hours

These statistics must be derived by first running the system reliability or LRU reliability displays and then copying them from either of these displays.

- (3) Type equipment code(s); specify up to 50 codes (the same codes as specified for the system or LRU reliability displays).
- (4) Type maintenance code(s); specify up to 50 codes (same codes as specified for the system or LRU reliability displays).

- (5) The LRU reference-designator vs WUC matrix (a two column matrix with up to 100 rows representing up to 50 reference designators)*.

One set of operate-time statistics must be specified to correspond with each specified type-equipment code. Otherwise, the display will end with the last type-equipment code to which these inputs correspond. The input of aircraft and system flight hours is mandatory. However, if system operate time is not specified, the display will be printed leaving the indices columns involving operate-time blank.

The display will contain data and indices only for those LRU specified via the LRU vs reference-designator matrix, Item 5, above.

4.9.4 Totals and Page Partitioning

The display page changes with each change in type maintenance, type-equipment. The title block and column headings are repeated on each page. Each type maintenance category produces a single page of display.

Totals and composite indices are involved with each change in type-maintenance and type-equipment.

*This provides for the case in which a system of interest may have two configurations (as indicated by the 3rd and 4th characters of the work-unit code), with each of 50 reference designators applying to two WUCs.

4.10 Master Input Tape Survey - Inventory of Type Equipments, Work Unit Codes, Organization and 3M Card Types

4.10.1 Purpose

Before transcription of the MDCS data to the 983-MDCS file format, it is desirable to determine whether the data are representative of the desired sample. The 983-MDCS master tapes are the product of the 3M data-separation algorithm which compiles the data, from inputs of MDCS and ASD data collected under the 3M system, on separate tape files.* The quantities of the various 3M card types, used to report Level-1 and Level-2 maintenance actions, including the technical-directive compliance reports, are tabulated by this display. The tabulation includes, in addition to listings of the type-equipment, work-unit, and organizational codes, selected ratios of the quantities of various 3M card types to provide an assessment of the completeness of card-type sets necessary for the complete reporting of a maintenance event.

4.10.2 General Description and Contents

The rows of the display list, in alpha-numeric order, the type-equipment (TE), and work-unit codes (WUC) in the first two columns. Column three shows the total number of cards present which have the WUC printed in Column 2. This is followed, in Column four, by the code for the organization reporting. Thus, a given WUC will appear in column two as many times as there are different organizations reporting on that WUC.

The twenty-four columns, following the first four columns, give the counts, within each WUC/organization category, of the numbers

*See Section 2.6, Figure 3.

MASTER INPUT TAPE SURVEY - INVENTORY OF TYPE EQUIPMENTS, WORK UNIT CODES, ORGANIZATIONS AND 3M CARD TYPES

MASTER TAPE NO. 11

DISPLAY DATE 03/16/72

T.E.	WUC	TOT	ORG	11	12	16	17	11/12	11/16	11/17	16/17	21	26	27	11/21	21/26	21/27	26/27	31	32	21/31	31/32	41	46	47	41/46	41/47
AFPH 29	0017	PE1	00	00	00	00	00	NA	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	17	00	00	NA	NA
AFPH 29	0006	PG2	00	00	00	00	00	NA	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	06	00	00	NA	NA
AFPH 29	0023	00	00	00	00	00	00	NA	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	23	00	00	NA	NA
AFPH 4122000	0006	PAL	03	01	00	00	00	5.00	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	00	00	00	NA	NA
AFPH 41220	0006	05	01	00	00	00	00	5.00	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	00	00	00	NA	NA
AFPH 4122100	0002	PE1	01	01	00	00	00	1.00	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	00	00	00	NA	NA
AFPH 41221	0002	01	01	00	00	00	00	1.00	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	00	00	00	NA	NA
AFPH 4122900	0003	PE1	03	00	00	00	00	NA	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	00	00	00	NA	NA
AFPH 4122900	0001	P21	01	00	00	00	00	NA	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	00	00	00	NA	NA
AFPH 41229	0004	04	00	00	00	00	00	NA	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	00	00	00	NA	NA
AFPH 4171000	0003	PAL	03	00	00	00	00	NA	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	00	00	00	NA	NA
AFPH 4171000	0008	PE1	08	00	00	00	00	NA	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	00	00	00	NA	NA
AFPH 4171000	0001	WAR	01	00	00	00	00	NA	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	00	00	00	NA	NA
AFPH 41710	0012	12	00	00	00	00	00	NA	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	00	00	00	NA	NA
AFPH 4171100	0004	PAL	00	00	00	00	00	NA	NA	NA	NA	01	01	01	.00	1.00	1.00	1.00	01	00	1.00	NA	00	00	00	NA	NA
AFPH 4171100	0027	PE1	02	00	00	00	00	NA	NA	NA	NA	05	05	05	.40	1.00	1.00	1.00	10	00	.50	NA	00	00	00	NA	NA
AFPH 4171100	0004	WAR	00	00	00	00	00	NA	NA	NA	NA	01	01	01	.00	1.00	1.00	1.00	01	00	1.00	NA	00	00	00	NA	NA
AFPH 41711	0035	02	00	00	00	00	00	NA	NA	NA	NA	07	07	07	.29	1.00	1.00	1.00	12	00	.58	NA	00	00	00	NA	NA
AFPH 4171200	0003	PE1	03	00	00	00	00	NA	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	00	00	00	NA	NA
AFPH 4171200	0001	P21	01	00	00	00	00	NA	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	00	00	00	NA	NA
AFPH 4171200	0004	WAR	00	00	00	00	00	NA	NA	NA	NA	01	01	01	.00	1.00	1.00	1.00	01	00	1.00	NA	00	00	00	NA	NA
AFPH 41712	0008	04	00	00	00	00	00	NA	NA	NA	NA	01	01	01	4.00	1.00	1.00	1.00	01	00	1.00	NA	00	00	00	NA	NA
AFPH 4171600	0004	PAL	00	00	00	00	00	NA	NA	NA	NA	01	01	01	.00	1.00	1.00	1.00	01	00	1.00	NA	00	00	00	NA	NA
AFPH 4171600	0002	PE1	01	01	00	00	00	1.00	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	00	00	00	NA	NA
AFPH 41716	0006	01	01	00	00	00	00	1.00	NA	NA	NA	01	01	01	1.00	1.00	1.00	1.00	01	00	1.00	NA	00	00	00	NA	NA
AFPH 4171900	0004	PAL	02	02	00	00	00	1.00	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	00	00	00	NA	NA
AFPH 41719	0004	02	02	00	00	00	00	1.00	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	00	00	00	NA	NA
AFPH 4171900	0003	PAL	00	00	00	00	00	NA	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	00	00	00	NA	NA
AFPH 4171900	0010	PE1	09	01	00	00	00	NA	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	00	00	00	NA	NA
AFPH 4171900	0001	WAR	01	00	00	00	00	NA	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	00	00	00	NA	NA
AFPH 41719	0014	10	01	00	00	00	00	NA	NA	NA	NA	00	00	00	NA	NA	NA	NA	00	00	NA	NA	00	00	00	NA	NA

MASTER INPUT TAPE SURVEY - INVENTORY OF TYPE EQUIPMENTS, WORK UNIT CODES, ORGANIZATION, AND 3M CARD TYPES

Display 10.

of individual card types which are present on the subject master tape and selected ratios of various card types. See the sample display in Appendix C.

The title block of the display gives the display name, a labeled space for manual entry of the subject master tape number, and a machine-entered display date.

Total rows are involved at each change in WUC fifth digit to show the total card counts for all organizations combined and the ratios based on the combined totals.

A page change occurs when a page field is filled. The title is repeated on each page.

4.11 983-MDCS/ASD File Survey Display

4.11.1 Purpose

Before proceeding with tabulation and analysis on a given batch of filed data, it is necessary to know if the data are reasonably complete and of sufficient volume. Assessments of the status of both the MDCS data and the ASD data are required. This display provides for the simultaneous assessment of both files, using only one document by displaying a count of JCNs for individual systems alongside selected flight, flight-hour, and NOR data for individual systems represented in the file.

Organizations which have reported MDCS, but no ASD (or vice-versa) during monthly intervals displayed are easily detectable through a rapid scan of the display to note blank or partially blank rows.

4.11.2 General Description and Content

The display is partitioned to show the individual system's data within organization categories on a calendar month/year basis. The organization code* and the year/month* are printed in the first and second columns, respectively.

The third and fourth columns contain overall totals only.

The third column ("OTH-JCN") gives the number of JCNs on file for the subject organization which have WUCs that have been designated in the display request as "other" systems, according to specifications of work-unit codes and type-equipment codes. These are given as display control parameters supplied when a display run is requested. Generally, when analyzing a specific aircraft subsystem (e.g., radar set, etc.) it is also advisable to have on hand data on the interfacing subsystems.

*This is the code for the originating organization -- the first three characters of the JCN. The date is the JCN date interpreted as a calendar date.

983-MDCS/ASD FILE SURVEY DISPLAY

ORG	Y/M	QTH	JCN	JCN/ORG	SYS	BUYSER	RF	NRF	TF	EFH/	NOFH/	TEH/	MCR/	RMC	HRS	T	MOD/	AWM/	T	AWM/
										SYS	SYS	SYS	SYS	RMC	HRS		SYS	HRS	SYS	HRS
AC8	1/03				0003	153308	0004	0005	000009	000061	000039	000150	000000	002451	000000	000000	002451	000000	001705	
AC8	1/03					153326	0000	0002	000002	000000	000033	000033	000000	003480	000000	000000	003480	000000	001265	
AC8	1/03				0001	153335	0001	0006	000009	000055	000182	000237	000000	000897	000000	000000	000897	000000	000520	
AC8	1/03				0003	153337	0002	0005	000007	000030	000096	000126	000000	001562	000000	000000	001562	000000	000995	
AC8	1/03					153850							000000	002215	000000	000000	002215	000000	002145	
AC8	1/03					153854							000000	003940	000000	000000	003940	000000	001345	
AC8	1/03				0202	153391	0000	0005	000005	000000	000100	000100	000000	001953	000000	000000	001953	000000	001205	
AC8	1/03				0201	153900	0000	0004	000004	000000	000048	000045	000000	004711	000000	000000	004711	000000	002465	
AC8	1/03				0010		0009	0027	000036	000146	000058	000694	000000	022734	000000	000000	022734	000000	011875	
ST	QTR1				0010		0009	0027	000036	000146	000058	000694	000000	022734	000000	000000	022734	000000	011875	
AC8	1/04				0205	153808	0011	0010	000021	000176	000161	000337	000333	001656	000000	000000	001656	000000	000210	
AC8	1/04				0006	153826	0014	0003	000017	000039	000036	000275	000300	002009	000000	000000	002009	000000	000930	
AC8	1/04				0201	153835	0006	0007	000013	000102	000043	000185	000300	004984	000000	000000	004984	000000	000200	
AC8	1/04				0202	153837	0009	0003	000012	000161	000049	000210	000000	004143	000000	000000	004143	000000	001778	
AC8	1/04				0201	153850	0007	0003	000010	000110	000032	000142	000240	000040	000000	000000	000040	000000	001360	
AC8	1/04				0202	153854	0005	0004	000009	000069	000045	000114	000200	004733	000000	000000	004733	000000	001760	
AC8	1/04				0201	153391	0016	0003	000019	000256	000078	000294	000063	002828	000000	000000	002828	000000	001095	
AC8	1/04				0206	153900	0017	0005	000022	000297	000076	000373	000000	002898	000000	000000	002898	000000	000300	
AC8	1/04				0034		0085	0035	000123	001410	000520	001930	000696	028291	000000	000000	028291	000000	007633	
ST	QTR2				0034		0085	0035	000123	001410	000520	001930	000696	028291	000000	000000	028291	000000	007633	
T	YR1				0044		0094	0065	000159	001556	001068	002624	000696	051025	000000	000000	051025	000000	019508	
AD1	0/10				0001	155529														
AD1	0/10				0001	155542														
AD1	0/10				0002															
AD1	0/11				0001	155566														
AD1	0/11				0001															
AD1	0/12				0007	155544														
AD1	0/12				0002	155546														
AD1	0/12				0002	155556														
AD1	0/12				0001	155767														
AD1	0/12				0003	155781														
AD1	0/12				0015															
ST	QTR4				000003															
T	YR0				000000															

Display 11. 983-MDCS/ASD FILE SURVEY

Display 11. 983-MDCS/ASD FILE SURVEY

for analysis should problem areas in the subsystem of interest tend to indicate interface problems. Thus, this display provides for the assessment of the quantity of data for these subsystems, which are also on file.

The fourth column ("JCN/ORG") shows, on the total row only, the total quantity of JCNs per organization for the given month which the file contains relating to all of the reported subsystems of the aircraft which are on file. In counting JCNs the program counts only JCNs which have been transcribed to the file from 3M source cards coded 11, 12, 16, 17, 21, 26, 27, 31, and 32 only. Suffixed JCNs are not counted.

Since this display has not been programmed to print a title block, display-run-request documentation should be initiated when requesting runs in order to provide identification. It is believed that this display is of the nature of "working papers" for the data analyst and consequently, titling is unnecessary. It is not intended for mass production and distribution.

The fifth column displays the number of JCNs ("JCN/SYS") applicable to the subsystem of interest for the individual systems and overall systems for the month on the total row.

The number in column 5 should equal the number in column 4 minus the number in column 3.

The sixth column of the display lists the BU/SER number of each system reported. This column divides the MDCS statistics (to its left) from the ASD statistics (to its right).

The seventh column of the display ("RF") gives the number of aircraft flights for which use of the subsystem of interest to the analysis would have been required. This is a subset of total flights reported for the aircraft in column nine (headed "TF"). These numbers in column 7 are tabulated on the basis of selected flight-purpose

codes (FPC) specified by the analyst requesting a display run. The FPC are included on the flight data cards in the ASD file.*

The next (8th) column (headed "NRF") gives the number of aircraft flights that do not have a purpose that requires use of the subsystem of interest. These numbers are, likewise, a subset of total aircraft flights, and they are derived on an FPC basis. The number in this column should be equal to the number in column 9 minus the number in column 7.

The same pattern that applied to the columns 7, 8, and 9 above, respecting flights, applies to columns 10, 11, and 12 (headed "RFH/SYS, NRFH/SYS and TFH/SYS", respectively)** except that the numbers represent flight hours rather than number of flights.

The last four of the sixteen display columns give not-operationally-ready (NOR) status data on the individual systems and totals for the organization over the month.

Column 13 shows the NOR, reduced-material-condition (RMC) hours accrued by the aircraft due to RMC on the subsystem of interest. Column 14 shows the total NOR/RMC hours for the aircraft, including the hours shown in Column 13.

Columns 15 and 16 give hours information similar to columns 13 and 14, except on awaiting-parts (AWP) status.

*See the "Navy Aviation 3M Manual," NAMP.

** It happened that the "system of interest" at the time the subject display was conceived involved only a radar set. Therefore, the heading terminology involves an "R". However, the display can be run for any kind of system assigned a WUC in the 3M-MDCS without modification to the program.

In Columns 10 through 16, which contain time information in hours, the right-hand digits represent tenths of hours, although the decimal point which normally would precede this digit position is omitted in this display.

4.11.3 Information Required When Requesting Display Runs

The following elements of information must be specified as display control parameters for a requested display run:

- (1) The type-equipment codes of interest
- (2) List of work-unit codes, to the 4th digit, designating the subsystems of interest.
- (3) The list of flight-purpose codes which are used by the program to derive "system flights, system flight hours, system NOR-RMC, and system NOR-AWP" statistics.
- (4) Date Range - the Julian dates signifying the begin and end dates, inclusive, for selecting data from the file for the display.

Specification of all of the above is mandatory to obtain a meaningful display.

4.11.4 Totals and Page Partitioning

The monthly total rows appear at the end of the month's data for each organization. Immediately following the third month's total row a quarterly total row is printed. At the end of 12 months of data on a given organization (or, if less than 12 months of data are on file at the end of the last month displayed) a yearly total row is involved. This follows immediately after the total row for the last quarter (or less, if the last calendar quarter did not contain 3 months of data).

The number of rows printed per page is varied by the program in order that a page break will not occur in the field of a given month's data. Thus, the last information displayed on any page will always be at least one, or all, of the total rows.

The column headings are repeated at each page change.

4.12 Data Transcription Run Error Print-Outs

4.12.1 Purpose

This display gives visibility to the errors which can be detected by the 983-MDCS data transcription programs during runs to enter data from the 3M card types into the 983-MDCS data file. It provides a count of each of the 57 kinds of errors and a summation of all errors occurring during each run. Also, it gives the count of the overall number of new file records (essentially a count of JCNs) added to the file during a run.

4.12.2 General Description and Contents

Whenever an error is detected during the process of transcribing data from the 3M card-type images to the 983-MDCS file, the computer prints the record image as it existed at the time of error detection. On the next print-out line below the record image lines the image of the CT on which the complaint is being registered is printed. This allows for comparison of the CT image and the record image without need for further documentation. Figure 1, Display 12, is an extract from an actual computer print-out illustrating the format.

For purposes of this print-out, the file record is blocked into units of 100 record positions each, with the last block containing record positions 1301-1329 only. Except for the first block and the last block, which are always displayed, only those blocks into which data have been filed at the time of detection of the error are printed. Thus, the print space is not wasted by displaying blank rows.

The first block is printed to supply record identification. It contains, in positions 1-11, the JCN. The last block, in positions 1326-1329, contains the record overflow indicator (see the MDCS-983 Data File Format, data element 302 and format note 38).

[illegible]

Display 12. REPRESENTATIVE ERROR PRINT-OUT SHEET FROM AN MDCS-983 DATA FILE TRANSCRIPTION RUN

The blocks displayed are identified by the number at the right-hand end of each row (0100, 0200 ... etc.). The number printed indicates the last numbered record position appearing on that row. The last record block is printed without block-number identification.

The block numbers provide a means for rapid identification of any record position on the displayed file image which may be referenced by the error statements accompanying the printed record.*

The error statement is printed at the right-hand side, opposite the last row of the file record image, just below the last block number.

On the last row of each record and error display is the image of the CT which was singled out by the error-detection process.

At the end of the display a page appears which summarizes the errors detected. There are 58 rows. The rows numbered 1 through 57 provide a reference to the error statements which are printed consecutively on them. Each statement is preceded by a number indicating the quantity of the error which occurred during the transcription runs.

The last row of the error summary sheet is not reference-numbered. It contains two totals. The first is the total number of errors of all 57 types which were detected. The second number is the quantity of records (essentially a count of JCNs) which were added to the 983-MDCS file during the subject transcription runs.

*Business-forms rulers available from commercial sources have 16-inch length and are divided into one-tenth-inch, consecutively numbered increments. These provide a convenient means to scale the display.

See Table-1, Display 12 for an illustration of the format of the error print-out summary sheet and the various error statements as provided by the computer.

4.12.3 Explanation of Error Statements

The error statements which are printed by the computer on the error print-out summary sheet are illustrated by Table-1, Display-12. This tabulation is representative of a computer-generated sheet. Since most of the error statements are consistent in format, an explanation of one of them, given below, will suffice for the majority of statements. Only others which do not conform to this format are individually explained.

The statement for error number 29 reads as follows: "10A 73-82 45-54 (16) 12-21 (34)." This statement indicates that, at the time of error detection, the computer program was processing data for entry into the file in accordance with 983-MDCS file format note 10A*. The data were being tested to qualify them for entry into file positions 73-82.

As noted on the file format, data for these positions in the file may be selected from either card types 16, 26, or 34. The data-file format also indicates that on card-types 16 and 26 these data appear in card columns 45-54 and on card type 34 they appear in card-columns 12-21. The error statement indicates this by the numbers "45-54(16)" and 12-21(34).

*See the ARINC Research MDCS-983 Data File Format, data element 23, "Serial Number of Removed Item," Level-1, record positions 73-82.

TABLE 1, DISPLAY 12

REPRESENTATIVE ERROR PRINT-OUT SUMMARY SHEET

01 0000 Card Type Columns 79-80	35 0000 22 648-656 33-41
02 0001 11/12 141-145 146-150 40-44	36 0000 22C 661-662 46-47
03 0000 11/12 161-175 176-190 55-69	37 0000 22C 670-689 55-74
04 0001 12A 151-160 45-54	38 0003 39 1248 28
05 0000 12A 191-195 70-74	39 0000 39 1249-1250 33-34
06 0065 19 422-453 27-58	40 0001 39 1252-1264 55-67
07 0011 23 690-704 12-26	41 0000 39 1265 75
08 0061 23 717-756 27-66	42 0000 40/41 1266(46) 1296(47) 45-74
09 0483 3 14 23 12-21	43 0000 Suffix Column 11
10 0003 9 63-67 55-59(11) 40-44(16)	44 0000 22B 644-647 29-32
11 0005 9 83-97 60-74(11) 55-69(16)	45 0000 Assist WC has 0000/48-51
12 0000 4 24-26 22-24	46 0002 18 399-401 22-24
13 0343 3A 38-44 38-39	47 0000 18D 413-414 46-47
14 0121 3A 45-46 40-41	48 0006 18C 410-412 43-45
15 0031 No Alpha in Column 8	49 0000 22C 657 42
16 0012 4A 27-29 25-27	50 0007 22A 663-669 48-54
17 0000 4A 51-52 46-47	51 0000 39 1251 42
18 0033 4E 48-50 43-45(11) 26-28(16)	52 0001 18F 402-404 25-27
19 0038 4D 47 42(11 12) 25(16 17 26/)	53 0000 Is it Asst WC 25-27 = 402-404
20 0000 4C 34-37 29-32	54 0000 No primary WC Ident
21 0001 4B-50 Not 43-45	55 0001 22D 658-660 43-45
22 0000 Not 00/46-47	56 0000 22E 641-643 25-27
23 0018 4B 30-33 29-32	57 0000 Is it Asst WC 25-27 = 641-643
24 0009 4B 53-59 48-54	0003421 00010509
25 0015 Level Column 28	
26 0000 Update Nonexistent JCN	
27 0036 10 68-72 40-44(16) 55-59(31)	
28 0267 10 98-112 55-69(16) 60-74(31)	
29 1484 10A 73-82 45-54(16) 12-21(34)	
30 0359 10A 113-117 70-74(16) 22-26(34)	
31 0000 18E 409 42	
32 0001 18B 415-421 48-54	
33 0002 18A 405-408 29-32	
34 0000 22 638-640 22-24	

When, as in the case of error number 31, there is only one card-type involved, the card-type numbers in parentheses are not included. Also, as in the case of error number 32, when there is more than one card-type from which the data could be transcribed, but the information is in the same numbered columns of all card-types, the CT numbers are not stated.

In three instances, errors numbered 2, 3, and 42, two note numbers are quoted by the error statement. These are cases where the notes imply that very similar computer logic is applicable to two sets of record positions. The card-type image of the CT in error, which is printed on the error print-out, and guidance provided by the file format sheet provide clarification of the statements in all instances.

Error statement number 1, "Card Type Columns 79-80", means that the card-type code has been found to be omitted on the card print-out. Omission of this data element from a card precludes proper identification of the data and filing is impossible.

Error number 15, "No Alpha in Column 8", is printed when a CT is encountered by the program that has data which complies with the prescribed attributes of data concerning a calendar inspection action, but does not have an alphabetic leading character in the serial-number portion of the JCN as required by the detailed documentation procedures.*

Error statement 21, "48-50 NOT 43-45", refers to record positions 48-50 and card columns 43-45 of an 11-card which contain the malfunction code reported. By testing the data in accordance with

*See the NAMP, OPNAVINST 4790.2, Change 1, Vol. III, Chapter 3, Section 304-e, "Detailed Documentation Procedures -- Calendar Inspections".

note 33, pertaining to data elements on the file format concerning assisting work centers, the computer can make the distinction between a primary work center and an assisting work center. Only assisting-work-center data must enter record position 1141-1178. One of the tests makes use of the rule that an assisting work center must report the same malfunction code as the primary work center being assisted (see file data format note 33, criteria (3)).

Error statement 22, "NOT 00/46-47" refers to the quantity of items processed as found on a CT-11 in card columns 46-47. Assisting work centers are required to report zero items processed. The above statement indicates that the computer has identified a record which, up to that point in the check process, meets the criteria for assisting-work-center identification, but the non-zero-items-processed quantity has disqualified it. (See Note 33-(3) in the file data format).

The error statement numbered 25, "LEVEL COLUMN 28", indicates the CT as being marked by a maintenance level code which is different from level-1 or level-2. These are the only maintenance levels for which the 983-MDCS was designed to function.

"UPDATE NONEXISTENT JCN" as an error statement indicates that a file up-date card was being processed and the JCN indicating the file record to be altered by the update does not correspond with any record JCN on file and the update operation cannot be carried out.

Error number 43, reads: "SUFFIX COLUMN 11". This statement may occur when the tests of the data are applied to CTs 41, 46, or 47, before entry of data in record positions 1248-1325. The file will not accept these CTs if they have suffixed JCNs. These cards contain Technical Directive Compliance (TDC) data. The detailed documentation procedures do not provide for suffixing the JCNs used on TDCs.

Error number 45, "ASSIST WC HAS 0000/48-51" singles out assisting work center reports where the man-hours data has not been reported.

Error number 53, "IS IT ASST WC 25-27 = 402 - 404", signifies that a CT being checked for transcription as an assisting level-2 work center in accordance with note 33, criteria (6), has qualified as an assisting-work-center card up to this point, but has been disqualified from file entry because the work-center code, in card columns 25-27, is equal to that on file in record positions 402-404. These latter positions are reserved for the primary work center's code. An assisting work center's code must be different.

Error number 54, "NO PRIMARY WC IDENT", signals that the computer was processing a CT-11 coded action-taken Y, maintenance level-2, having a non-suffixed JCN. In this instance one of the qualification checks before entering these data in file record positions 1127-1140 (which are reserved for level-2 troubleshoot-action data) is that the card's work-center code (card columns 25-27) must equal the work-center code on file in record positions 402-404. Lacking this equality of data elements, the computer will classify the data as erroneous.

The error statement "IS IT ASST WC 25-27 = 641 - 643", which is numbered 57, has the same meaning as the similar statement numbered 53, except that it applies to the subassemblies section of the file format.

4.12.4 Page Partitioning on Totals

There is no page partitioning of the error print out, except that a new page is started when the error summary list is printed.

Totals for cards of the 57 detectable errors and the overall error sum are printed on the summary sheet along with the number indicating the total number of new file records generated by the current transcription run.

The error print-out is not titled since it is of the nature of analyst's working papers and is not intended for general distribution.

4.13 Residue File Print-Out

4.13.1 Purpose

The 983-MDCS residue file is the magnetic tape containing the 3M CT images of records which could not be entered into the file. Such non-entry may be due to lack of file space, lack of proper identification, or any of the other reasons given under the section of this appendix entitled "Residue File Codes", Section 2.5.1*. This display gives visibility to the residue file records, providing a means for monitoring the contents of this file.

4.13.2 General Description

As illustrated by Figure-1, Display 13, this display is simply a close-spaced print-out of the 80-column card-type images. Each individual CT image occupies one row of the print-out and is assigned a record number, printed to the left-hand side, following the symbol "REC." The word "DATA" followed by the number "80" indicates that the number of character positions allowed by the computer for the record which follows was 80 positions. As illustrated by the figure, the printed records are arranged in blocks of 100 each.

The residue file print-out -- along with the error print-out -- is a product of each 983 MDCS file data transcription run. Titles are not provided since the print-out is regarded as analyst's working papers which are not for general distribution.

*See Section 2.6 and Figure 3 for a description of the use of the residue file tape on subsequent file transcription runs to affect automatic transcription of records from the residue file to the main file if identification of any residue records by comparison with current data is possible.

[illegible]

```

***** DEVICE 194 SYS014, HJDE CO      BLOCK 2 DATA 8000

```

Display 13. 3M CARD IMAGES AS DISPLAYED ON A REPRESENTATIVE PAGE OF THE 983-MDCS RESIDUE FILE PRINT-OUT